MODERN PLASTICS

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JANUARY

So many of our readers have requested technical information lately that we shall expand our Technical Section beginning with the January number.

We shall begin by presenting a rather complete symposium covering the most recent progress made in Coatings, Laminates materials, Ureas, Phenolics, Vinyls, Cellulose plastics, Ethylcellulose and Molding Techniques.

Beginning in February, we shall launch a series of articles dealing with synthetic finishes and coatings which is in answer to recent reader demand.

ADVERTISING PAGES REMOVED

IN SELECTING A SOURCE OF SUPPLY FOR YOUR MOLDED PLASTICS

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MODERN PLASTICS

DECEMBER 1939 VOLUME 17 NUMBER 4

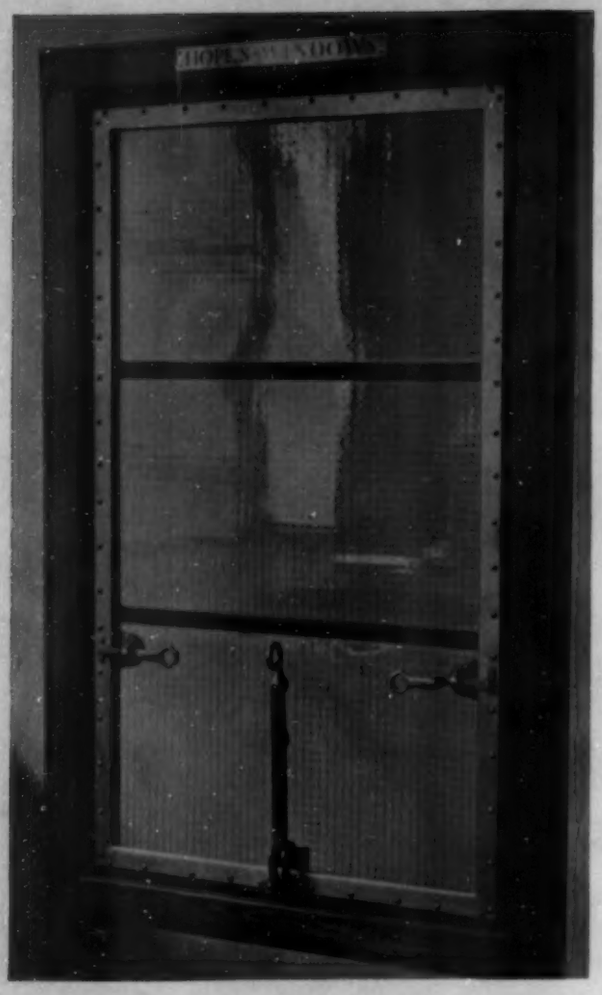
The molded phenolic case of this A. R. P. lamp represents one of the many outlets for phenolic resins in war time. (All photos, courtesy *Plastics*, London)

THE BRITISH PLASTICS INDUSTRY IN WAR TIME

by JOHN S. TREVOR

THE BRITISH PLASTICS INDUSTRY IS CONFIDENT and secure in the knowledge that ample supplies of plastic materials are available and that the well developed and organized home chemical industry can be trusted to meet the expected abnormal requirements for basic raw materials.

All the most important plastic materials are produced in Great Britain, which is, of course, very fortunately placed as regards supplies of phenol and cresylic acids and, thanks to the foresight of Imperial Chemical Industries in building a synthetic urea plant, this country is completely independent of all foreign supplies of urea. As regards cellulose acetate, which is in very great demand at the moment, there is not likely to be any serious shortage now that supplies from Germany have been cut off. The British Celanese, Ltd., who have pioneered the manufacture of acetate material in this country, have the large scale organization able to supply a greatly increased tonnage. The development of polystyrene resins will now be greatly accelerated as the result of the recent decision of The Distillers Co., Ltd., to reach an arrangement with The British Xylonite Co., Ltd., to take a half share in B. X. Plastics, Ltd., the plastics material manufacturing subsidiary of The British Xylonite Co., Ltd. It will be remembered that The Distillers Co., Ltd., produces "Distrene," the wholly British poly-



Air raid precaution window (top), glazed with Armourbex acetate sheet and reinforced with welded steel wire mesh, was able to withstand the shock of a 150 lb. bomb exploded 6 ft. away. Lower photo shows fragments of broken glass adhering to acetate sheet, approximately 5/1000 in. thick after an explosion test

styrene resin, and also has available, as the result of its distilling activities, a number of raw materials used in the manufacture of plastics of various kinds.

Contrary to expectations, the lack of German vinyl chloride plastics, such as Mipolam, is not likely to cause anything but a temporary embarrassment. Adequate supplies of the I. C. I. material, Polythene, have been promised. According to one of the high officials of the General Post Office Research Station in London, this material has electrical properties greatly superior to the German polyvinyl type of resin. In addition, manufacturers have been promised healthy consignments of Koroseal through the British Tyre & Rubber Co., Ltd., who are the English agents for B. F. Goodrich Company. Koroseal should be of very great interest to British manufacturers, as it can be extruded and generally worked with comparative ease by cable companies.

The British plastics industry is looking forward to the time when it will be able to obtain large supplies of plastic materials from America and there is no doubt that this demand will also help American industry to a considerable extent. Shipments of cellulose acetate in sheet form would be exceedingly welcome as most of the Government orders necessitate the use of sheets of various thicknesses from $^{8}/_{1000}$ to $^{10}/_{1000}$ in. to $^{1}/_{4}$ in. in clear and colored grades depending, of course, on its special applications. Supplementary supplies of acetate powder for injection molding and some of the newer cellulose plastics, such as ethylcellulose, benzylcellulose, etc., should also prove very helpful to the home industry. Ethylcellulose will be welcome to cable manufacturers doing special work requiring a low temperature heat insulator of high quality. American phenolic, vinyl chloride and polystyrene resins will also find a ready market in the United Kingdom.

As regards the work now being carried out by the British plastics industry, it is impossible to mention many of the most interesting orders for Government departments, as they are on the Secret List. With the permission of the Censor, however, who will have to O.K. this article before it is allowed to leave the country, it might be mentioned that all branches of the plastics industry are making valuable contributions to the equipment of the armed forces and civil defense units. For instance, casein buttons are being made by the million for the battle dress of the fast-growing British Army. These somber looking buttons are preferred to the old fashioned brass ones because they do not require the old button stick and elbow grease and secondly, because they do not reflect light like the metal ones. This is very important in night raids, and in the last war a good many casualties were due to enemy snipers aiming at those tiny spots of reflected light from gleaming brass buttons. Cellulose acetate sheet material is extensively used for fabricating aircraft fairings, ducts of all kinds and the thin sheet is pressed out into millions of anti-gas eye shields used to protect both soldiers and civil defense workers from tiny splashes of blister gas. A considerable quantity of thin acetate material is also used for making the visors of gas masks. Small injection

moldings are in great demand for a hundred and one aircraft purposes and the authorities are continually replacing metal for plastic parts to increase the lightness of the craft. There is no doubt about it at all, the British Air Ministry is very definitely plastics minded, but, unlike its opposite number in Berlin, it is very definitely opposed to the Ersatz principle, that is, merely jettisoning metal because it is scarce, irrespective of whether the plastic replacement will be an improvement. The conservative English authorities insist on every new introduction being a very definite improvement and their specifications cause not a few headaches among many of the prominent aircraft manufacturers.

Phenolic resins are in very great demand for all kinds of electrical accessories to be used on implements of war and for general utility purposes. It will be realized that with a duplication, even triplication of electrical systems by public utility companies, municipal concerns and others to meet a possible emergency as the result of air raids, there must be in reserve a very considerable supply of all component parts. One of the most recent and certainly a very interesting new use of phenolic molding powder is for molding cases or containers for civil gas masks. This potential market is enormous as every civilian in the United Kingdom is supplied free with a gas mask in a cardboard container. During wet weather, and most Americans are aware that England certainly does have its share of rain, these cardboard containers soon get damp and pulpy, and eventually, useless and use has, therefore, to be made of leather cloth or leather cases and satchels. A really good molded holder is a thoroughly satisfactory solution of the problem. In the electrical field there is also a growing demand for polystyrene moldings and this is where Distrene will find its true place. This is a very high grade material and its electrical properties are as follows in the next column up above.

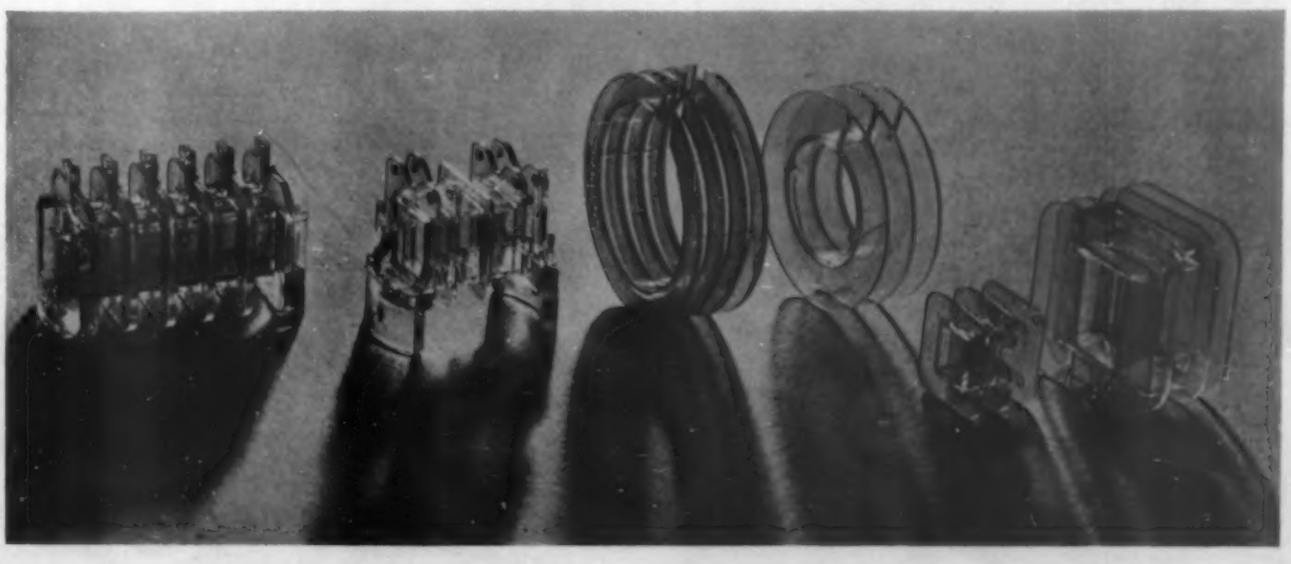
Frequencies	S. I. C.	Loss Factor
50	2.2	0.0002
1000	2.2	0.0005
200000	2.1	0.00044
650000	2.1	0.0002
1000000	2.3	0.0002
40000000	2.3	0.0001
Breakdown voltage (50 cycles, volts per mil.)		500–700
Volume resistivity		$> 10^{17}$
Surface resistivity		$> 10^{16}$

Although it might quite naturally be thought that urea moldings, used mostly for the luxury trade, would not be required during the strenuous days of a modern war, this is not the case. A certain falling off in output has, of course, been experienced, but there is a strong indication that British women, at least, will still want containers and novelty packs for cosmetics, etc. Besides, urea moldings for the electrical industry are certain to be in good demand and manufacturers are viewing the future with some degree of optimism. A development now receiving a great deal of attention is the use of luminous urea plastic moldings for military and A. R. P. work. Switch covers, instrument panels and dials and many other vital electrical components which are required to be visible in a blackout could all advantageously be molded of luminous urea plastics.

British tool manufacturers are all exceedingly busy on Government work and while fully capable of supplying normal trade orders for plant it may take a few months for them to adapt themselves to the new position. This is where the American plant producer can be of the greatest assistance and if ships can be spared it is hoped that the home industry will be able to draw on American reserves for presses of all kinds, particularly the type of lightly built and moderately priced injection molding press previously supplied by German firms, such as Franz Braun of Zerbst and Eckert and Ziegler of Braunsfelde, Nr. Cologne.

(Please turn to page 72)

Coils and electrical parts shown below are injection molded of Distrene, polystyrene resin. Most of this plastic material was formerly imported from Germany, but production in Great Britain by The Distillers Co., Ltd., is rapidly increasing



1

2

PHOTOS BY EZRA STOLLER

A striking display and merchandising feature of the new W. T. Grant Buffalo store is in the central show window, with its semi-circular display and sales counter (1), faced with Formica in tones of gray, black and coral. The back wall of the window has been eliminated to allow the prospective customer a clear view of the interior (3). In the inviting Lunch Bar (2), roomy counters are surfaced with deep wine Formica, easy to clean and permanent in color and smooth finish

BACKGROUND FOR MERCHANDISING

A variety of plastics find architectural and decorative applications in W. T. Grant's new Buffalo store

DURING THE PAST FEW YEARS, DARING AND sophisticated specialty shops have successfully employed such modern merchandising ideas as striking facades, dramatic display, vivid color effects and decorative interior settings. However, this sales approach is still something new in the field of the chain variety store with its mass-appeal merchandise. The new unit, recently added to the chain of W. T. Grant's department stores at Buffalo, New York, represents a splendid integration of outstanding architectural design, modern materials and efficient planning.

Simple and restrained in exterior and interior design, the new store was designed under the supervision of Raymond Loewy, industrial designer. Alfred S. Alschuler, Inc., were the collaborating architects. In building for permanence, materials were selected for serviceability and for their beauty and decorative possibilities. The distinctive properties of the laminated plastic materials made them particularly adaptable for the interior uses which were specified by the designer. Other plastics were used in conjunction with a variety of structural materials to add color and style.

The new building occupies an important corner location and full advantage was taken of the possibility of attracting customer traffic by making a novel departure from traditional window display practice. The back wall (or screen) of the center show window was eliminated so that the prospective customer can clearly view the interior of the store itself, with the typical chain store mass buying animation furnished by customers in action. In keeping with this "Selling the customer from Main Street" idea, a streamline counter following the flowing contours of the semi-circular window, combines the dual features of an interior merchandise counter and a specially designed window display. Faced entirely with laminated phenolic plastic material, in tones of gray, black and coral—brilliantly illuminated and stacked with attractive promotional merchandise—this counter has beauty and psychological sales value.

Traditional type shop windows, enlivened by animated displays, flank this "arcade" window. The exterior of the building is given stylized horizontal treatment. A simple dignified facade and architectural forms, which give major emphasis to light and shade, produce large, mass effects. Modern materials are used, such as off-while limestone, gray-blue terra cotta and black granite. There are white bronze signs, decorative glass and touches of colored plastic.

In the air-conditioned interior, all dramatic interest is centered on the display of merchandise. Color treatment is soft and makes use of tones such as light coral tinted walls, contrasted with deep coral laminated phenolic wainscoting; basswood veneer as a foil for light gray; gray laminated phenolic highlighted with satin finish aluminum. The ceiling colors are off-white and light gray. Flooring is of Terrazzo in coral-beige inlayed with white bronze strips and accented with a border of red levanto.

While background colors have been kept simple, so as not to distract attention from the merchandise, any feeling of monotony is relieved by contrasting color effects and the brilliant display of merchandise.

Lighting of the store has been scientifically planned and is both direct and indirect. Flush, recessed ceiling fixtures with reflectors above the lights and prismatic lenses below, are spaced to give a rhythmic pattern of concentrated light and are symmetrical with the sprinkler heads. This panel of brilliant illumination is in contrast to the adjoining area of lower light value, which takes the form of coves set into the dropped side ceiling. These lighting fixtures and the ventilating units have been integrated, making a single, compact unit for both.

Interior signs make use of the new fluorescent plastic material to identify such sections as the Pet Shop, Basement, Ladies' Lounge, etc. Cut out of this colorful acetate, the letters project about three inches from the background. Signs are edge-lighted, distributing and reflecting light wherever the surface is engraved or cut. Letters are of deep coral fluorescent plastic set against a background of blue and white.

Among the main floor departments, the Flower Shop is particularly unique. A charming American Colonial three-dimensional flower garden, illuminated by soft fluorescent lighting, forms a beautiful picture-frame background for the artificial flowers offered for sale.

Set apart from the main selling area, the cheerful Lunch Bar has horseshoe-shaped counters, topped with a deep wine-colored laminated phenolic surface. Easy to clean, resistant to stains, spots and cigaret burns, the smooth finish of the plastic and (*Please turn to page 74*)

3

NEW MATERIAL FOR SPEED CAMS

by G. O. SMALL*

A combination of molding and laminating phenolic of special formula opens new engineering opportunity to reduce weight, vibration and noise

IN THE LAST FEW YEARS, *SPEED* HAS BECOME A vital factor in the profitable operation of practically every type of manufacturing endeavor, from the making of automobiles, ships and airplanes to simple, everyday articles fashioned from steel, wood and leather. Among the first to feel the pressure for more rapid production were shoe manufacturers. Because "stock" shoes have given way almost entirely to "seasonal" styles, the time between manufacture and sale is greatly reduced which means that shoe machinery must be speeded up to meet the demand.

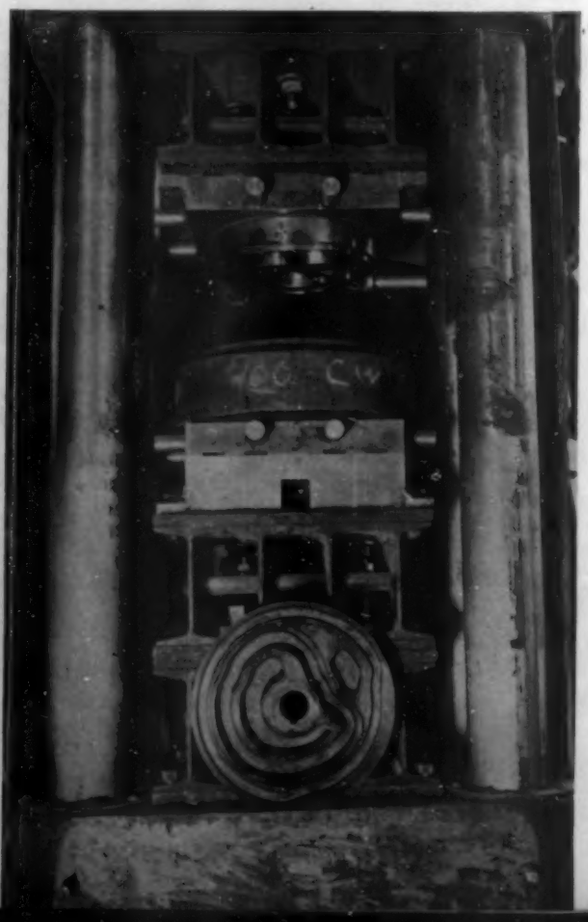
Machines having many cam motions and connected reciprocating parts are found with great frequency among those used in the manufacture of shoes and nowhere is there greater necessity for designs that reduce vibrations and consequent noise. So along with a higher rate of speed, these machines must be made to operate more quietly and with fewer repairs.

In machines having rotating parts only, increasing the speed is merely a matter of better balancing, better lubrication and, in some instances, better materials, but in machines having reciprocating or oscillating parts, the speeding-up process is quite another story. These must have all moving parts in better balance, and reciprocating or oscillating parts must have the mass reduced to the lowest point consistent with strength, in order to lower the inertia as much as possible. Also, in reciprocating parts that are actuated by cams, this increase in speed may call for careful study of the cam design as well as the reciprocating part itself. In cams producing sudden changes in direction of other connecting parts, the cam track must be designed so that the shock effect is minimized to the lowest possible degree. It is equally important that the material in the cam should be light weight, easily lubricated, and capable of withstanding repeated shocks without fatigue.

An outstanding example of the manner in which one manufacturer has overcome the difficulties caused by the necessity for increased speed, is illustrated in the modern version of the Goodyear Stitcher, manufactured by the United Shoe Machinery Corp. The original Goodyear

* Plastic Dept., General Electric Company

United Shoe Machinery Corp.'s new Goodyear stitching machine (below at left) makes use of new molded-laminated Textolite cams which reduce cost, vibration and noise. The mold for one of the cams is also pictured below at the right



This close up of the stitching machine head, with cover removed, shows the location of the four Textolite cams which actuate the various operations incidental to stitching heavy leather. Tests indicate that the plastic cams will out-wear all other parts of the mechanism and they require a minimum of lubrication in service

machine—used for sewing soles on men's and women's shoes made by the Goodyear welt process—was developed many years ago. At the time, it helped to revolutionize the shoemaking trade and has been a prominent factor in the industry ever since.

However, the cams located in the head of the machine which were considered of good design and operated efficiently a few years ago, will not stand the strain of higher rates of speed necessary today. Fully appreciating this fact, the United Shoe Machinery Corp. assigned to its Research Department the task of finding a more competent material from which the cams could be made.

From past experience with plastics, which had been used for some time in gears, clutches and other small parts, the company was more or less familiar with the characteristics and possibilities of these materials for such purposes. Therefore, it was only natural to consider them for use in the proposed new cam.

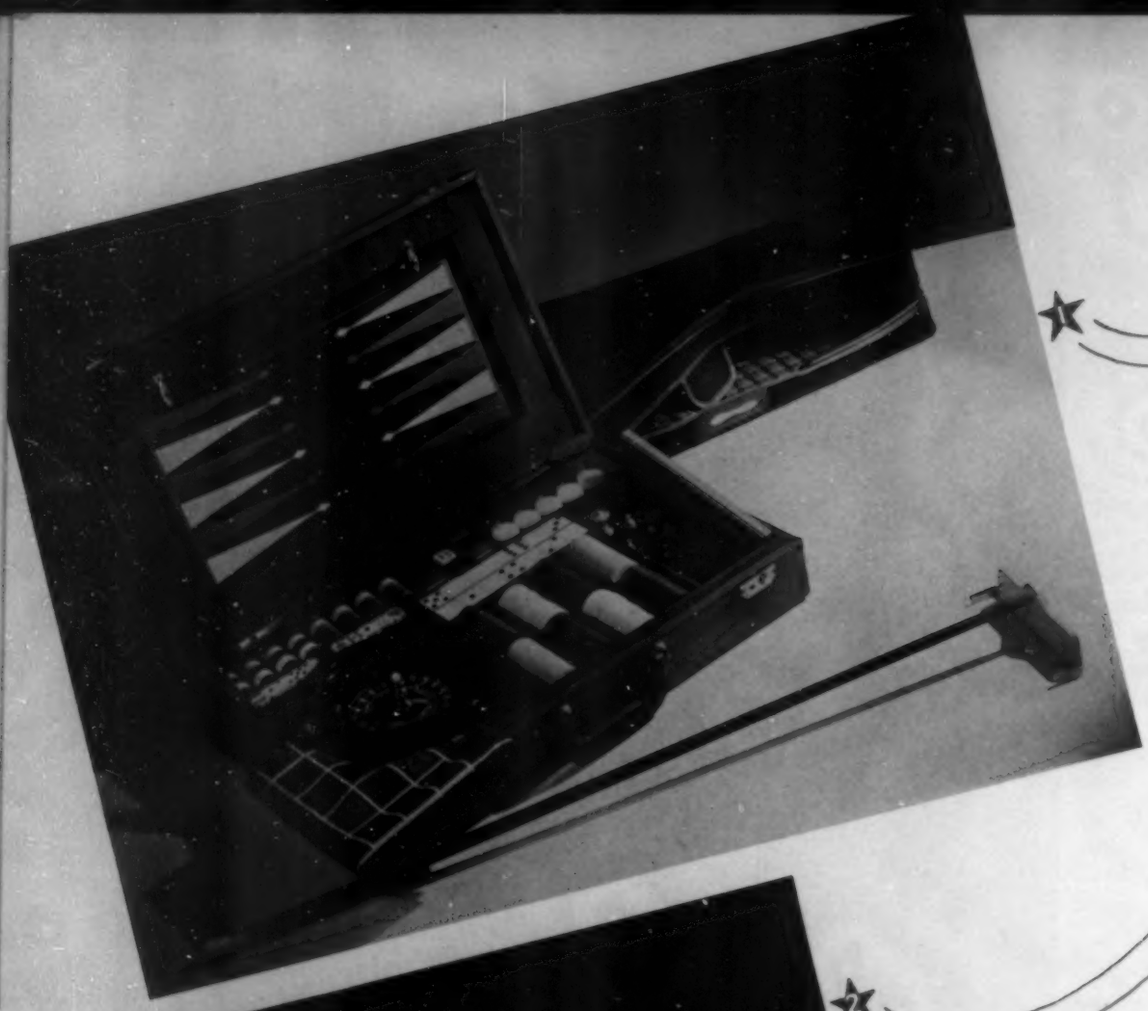
The decision in favor of plastics was made in a comparatively short time. But finding a plastic material with exactly the right properties for the job was something else again. As a matter of fact, it was five long years before repeated tests and research led to the adoption of a special phenolic laminated compound (graphite impregnated) which experiments proved was superior to other compounds recommended for cams.

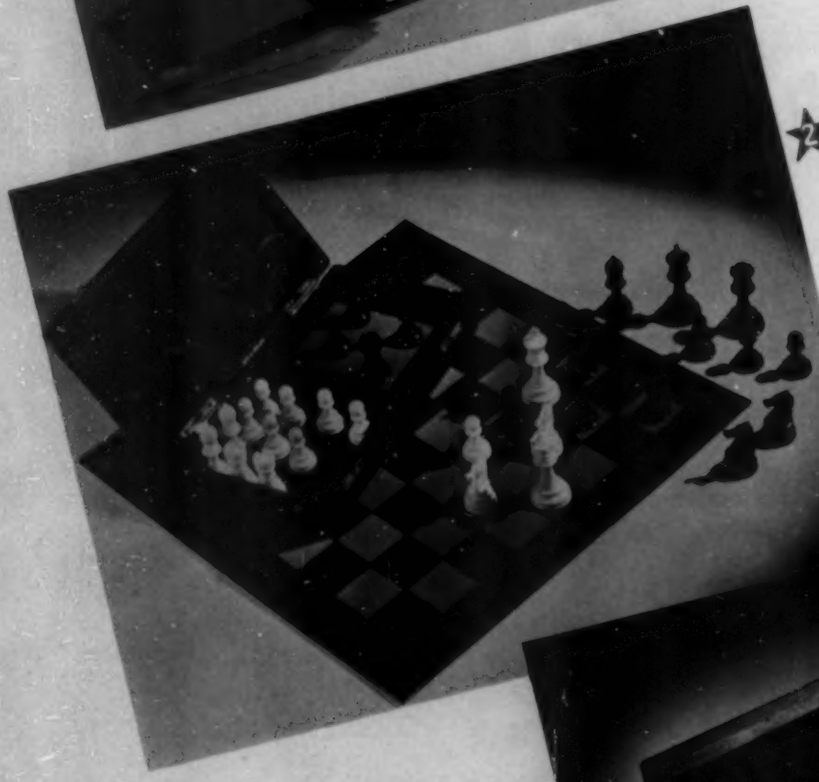
Severe tests, which resulted in the elimination of one material after another, were worked out to subject each type to the same kind of treatment it would eventually encounter in its position in the stitching machine head.

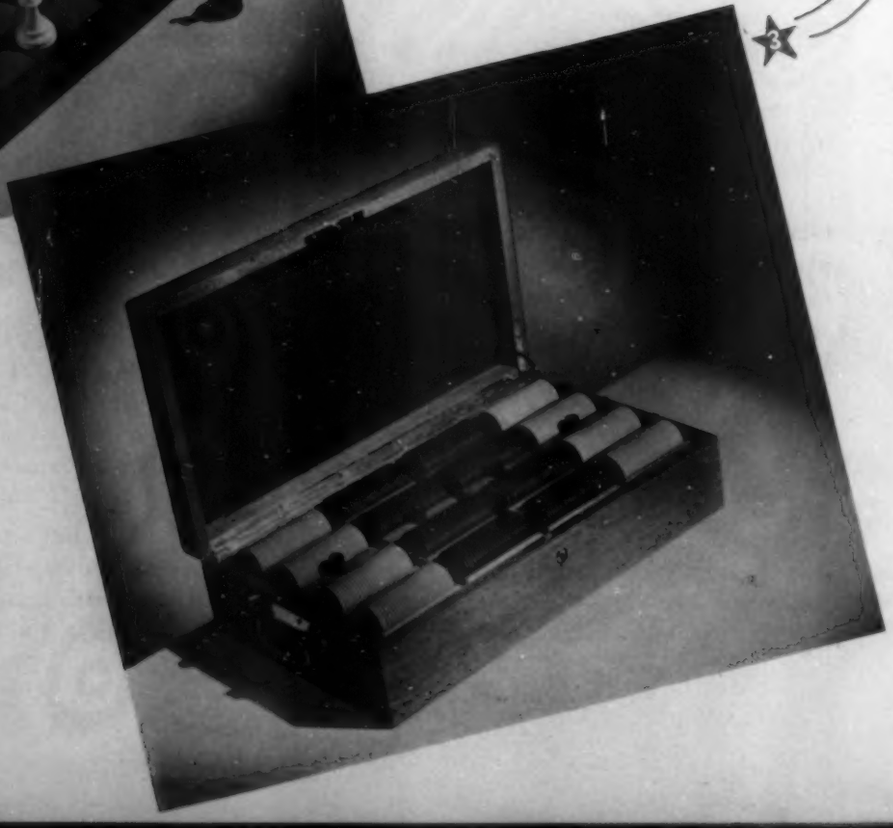
One testing device, designed to simulate the action of the cam on the machine, consisted of a hardened steel roll 3 in. O.D. by $1\frac{1}{4}$ in. which was actuated by an arm controlled with a heavy spring. The roll was pressed down for a few seconds against similar plastic blanks of various grades, then released and this alternate pressing down and releasing continued until three of the four materials being tested had failed. The specific results of this test were:

At 950 r.p.m.	Pressure—764 lbs.
No. 1 Material	4,699,000 cycles—failed
No. 2 Material	5,220,000 cycles—failed
No. 3 Material	4,729,000 cycles—failed
No. 4 Material	15,000,000 cycles—still good
At 950 r.p.m.	Pressure—1181 lbs.
No. 1 Material	70,000 cycles—failed
No. 2 Material	Approximately the same—failed
No. 3 Material	Approximately the same—failed
No. 4 Material	267,000 cycles—failed

Shearing or cutting action and friction characteristics were also determined by this test. The steel roll was not allowed to go all the way across the face of the plastic blank and this procedure quickly (*Please turn to page 76*)



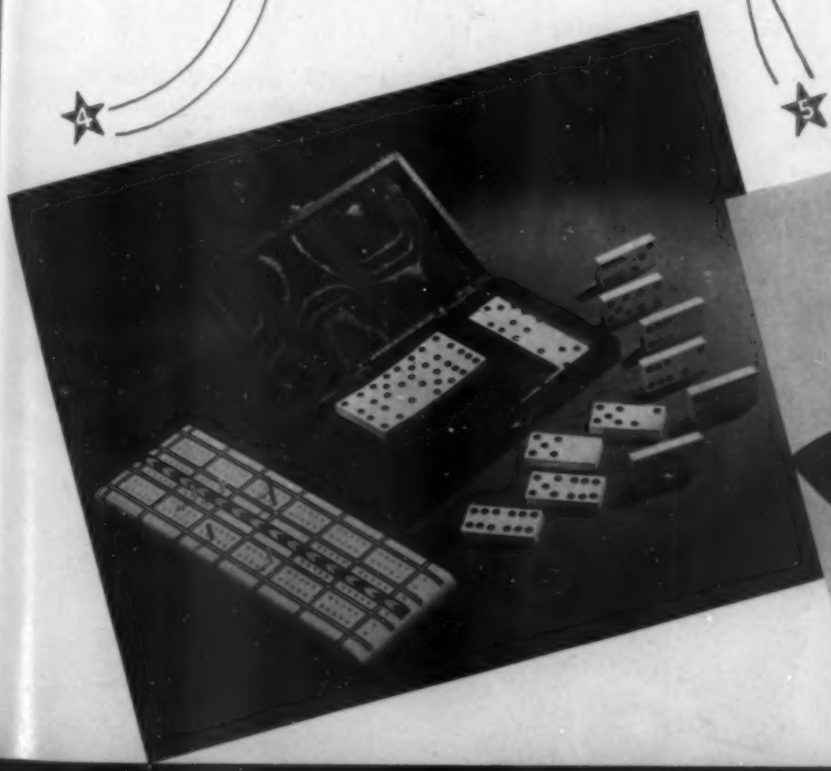


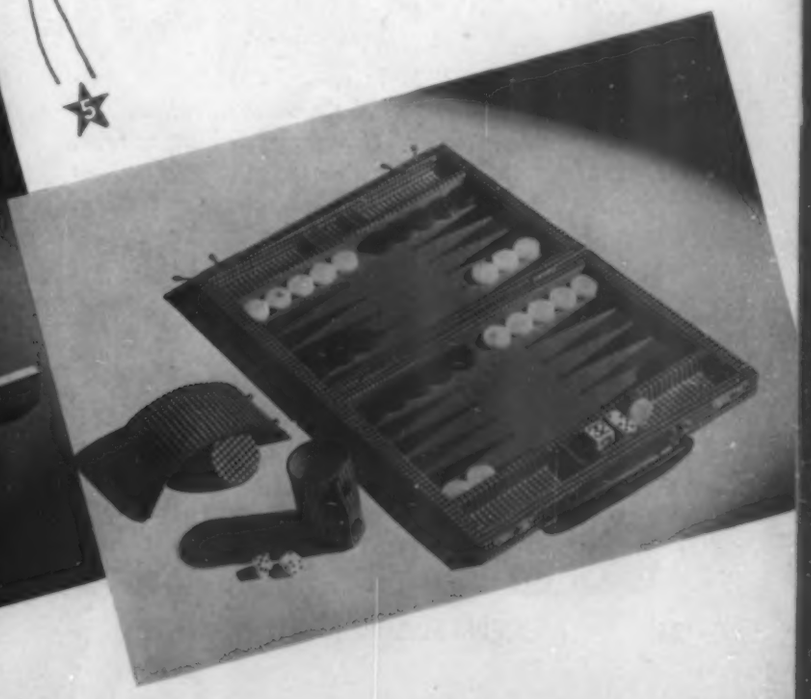


FOR FORTUNE OR FUN

by EVE MAIN

ROULETTE AND POKER CHIPS THAT KEEP THEIR SMOOTH, UNWARPED FLATNESS INDEFINITELY, chessmen that never split or crack, clean white dominoes that carry on to a ripe old age without discoloring, and precision built dice that roll fairly at every throw, have a lot to do with the continued usefulness and enjoyment of the game whatever it may be. Because they have these covetable characteristics, plastics have become the Number One choice of material in the production of the finest quality games and game sets, offered for sale in the highest type stores. Abercrombie & Fitch, for instance, specifies plastic playing pieces wherever they are at all possible. Chosen at random from the abundant and varied stock displayed in the game section of its store are these typical examples: (1) A collection of games which will while away many a long evening includes plastic checkers, dominoes, dice, and backgammon doublers. There are plastic poker chips and smaller chips in a rainbow selection of colors—red, yellow, brown, blue, white, orange, green, orchid, pink, and turquoise—to be used with the miniature molded plastic roulette wheel and felt layout cloth. A backgammon-, checker-, chess-board, two packs of cards and a set of wood chessmen complete the ensemble. All these are packed in a cowhide case which in turn is zipped into a protective carrying cover and the complete set retails at $80.00. Resting against the case is a croupier's rake with white plastic chip pusher or hauler at the bottom and a knob of the same material at the top. (2) A set of black and white plastic chessmen in a black leather, velvet lined case stamped "Made in England" sells at $30.00. (3) Yellow, blue, red and white plastic poker chips are stacked in removable wood trays fitted into an inlaid wood case which has brass handles and lock. The price tag for the set reads $53.00. (4) At the left is an ivory plastic cribbage board with inlaid marquetry pattern and plastic pegs that repose in a sliding covered pocket in the under side of the board when not in use. At the right is a set of pure white plastic dominoes with glistening black spots (made in England) that fit compactly into a leather case. Each of these games is marked $12.50. (5) A backgammon set for the traveler ($7.50) has plastic dice, red and white playing pieces of cast resin, and dice boxes that unsnap and packed flat for traveling.





RCA Manufacturing Co.'s new record rack for Victor and Bluebird records is molded of Textolite by the Plastics Dept., General Electric Co. Although simple in design, the forty separating louvers were stubborn to mold and both new compounds and molding technique had to be worked out before success was achieved. The lettering and numerals were printed by the MarkemMachine Co. process

HOLDING ALL RECORDS

by AL HAYWARD

A simple design which proved difficult to mold

EVER SINCE THE FIRST PHONOGRAPH WAS PERfected for home entertainment, there has been a need for a safe, convenient method of storing or filing records. Grandma's plan of arranging them in piles on a shelf or table served her all right but with constant shuffling, arranging and rearranging, records often were broken or worse still, developed noisy scratches that all but ruined the melody.

Racks and holders for records, designed from time to time, have made it a simple matter to classify different types of music for easy selection. At the same time, separations of one kind or another keep the records from rubbing against each other so there is less trouble from scratches. Of course, records still break if they are dropped just right but the storage system can hardly be blamed for that.

There are cabinets, large and small, fitted with slots for individual records; there are record "libraries" made up of a series of shelves where the records are placed in stiff cardboard covered albums; and there are holders with wooden frames in which records are kept apart by metal disks. But the most recent version is the all-molded phenolic plastic record rack turned out for RCA Manufacturing Co.'s Victor and Bluebird records.

Because of its size and intricacy of design, this record rack represents a real achievement in the molding of plastic material. That it has unusual merit was quickly recognized by the judges of the Fourth Annual Modern Plastics Competition, who unanimously selected it as deserving of a major award in the Decorative Products, Molded, group.

Every step in its production—construction of dies, development of plastic compound, method of molding, printing of numerals to identify (*Please turn to page 68*)

SLUSH MOLDING

by E. S. HORSMAN*

THE DEMAND FOR NEW MATERIAL AND NEW approaches is no more persistent in any industrial field than in the advertising and display business where research is continually directed toward novelty lighting effects and materials that are flexible enough to adapt themselves quickly and effectively to a variety of conditions with a minimum amount of expense. Plastics are playing an increasingly important part and one of the newer applications in the cast resin field has been seized upon by the advertising business and used to excellent advantage.

In the *A* stage, cast resins are in liquid form and since their inception, experimental tests have been run in an effort to produce a resin which in conjunction with the proper accelerator would harden rapidly and permit the production of articles using the procedure employed in slush molding white metal and similar materials. Sales Promotions, Inc., in conjunction with our laboratories have recently turned their activities in this direction in an effort to produce for Levy Bros. & Adler Rochester Co., men's clothing manufacturers, a display of outstanding institutional and product effectiveness. The result is the hollow cast resinous display illustrated. When lighted from within, details are emphasized and the complete display is flooded with a mellow glow.

To manufacturers of displays, this method of production offers several advantages. Any work of art, any article or advertising item may be reproduced without tool expense. Since the reproduction is hollow, a minimum amount of material is involved, which reduces shipping expenses, eases handling costs, and keeps the cost per unit within the national display distribution budget. A variety of color effects may be had which in the daytime offer effective institutional advertising, and indirectly lighted at night, demand and hold attention.

The technique in the construction of slush molds for resin casting is not basically new. Latex rubber is sprayed on the object to be reproduced, and allowed to cure to the proper consistency. To give the rubber sufficient rigidity, and to insure its remaining immovable during the slushing operation, a fairly heavy coat of plaster of Paris is spread over the entire outer surface of the rubber. The plaster shell is cut away from the mold in such a manner that no undercuts remain in any section. The plaster sections are then fitted with dowel pins so they can be joined into a rigid hollow mold.

Since the rubber coating on the model snugly fits undercuts of varying depths, yet stretches readily, it is not always necessary to cut the rubber away in sections corresponding to those in plaster. Consequently, the rubber sections are somewhat larger than those in plaster, but their outer surfaces fit securely into the inner surfaces of the plaster sections. When thus assembled, we have a rubber lined plaster slush mold ready for production.

Liquid resin properly accelerated is then poured into the orifice of the mold and agitated by revolving or slushing the mold for a period of fifteen to twenty minutes. The accelerator cures the resin to the necessary hardness in this time. Excess liquid is poured off and the mold dissembled, first removing the plaster shell, and then stripping the rubber lining. The resultant casting faithfully reproduces detail, and has a sectional measurement of $^1/_8$ in. to $^3/_{16}$ inches. The casting is light, tough and translucent. The natural color of the resin may be complemented by the application of such lacquers or spray paints as will emphasize in the display its best characteristics.

If properly handled, the mold can be used for about one hundred and fifty castings, and production can be increased by the simple expedient of producing additional molds with the same casting capacity.

Exemplifying slush molding technique, this illuminated hollow Catalin display, was cast of fast-drying liquid resin by Sales Promotions, Inc., for Levy Bros. & Adler Rochester Company

* Catalin Corp.

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PLASTICS IN REVIEW

3

1. Holiday greeting cards in simple stylized motifs, made of colored Lumarith pieces hand appliquéd on a background of the same plastic, strike a warm personal note. Carved facsimile signatures give an unusual three-dimensional effect and are available for stationery and calling cards. Designs are by Otto Lorch or individual decorations are applicable

2. The tradition of fine artistry, distinctive coloring and creative design is indeed apparent in the progress made by Italian plastics manufacturers in following the world trend of plastics for bottle closures, lipstick and cosmetic containers. Multicolored articles in two or three shades, molded in one operation by Abbiati and Fabbri, are particularly unique

3. Suitable for premiums or advertising novelties, auto key rings in innumerable bright shades of Catalin are manufactured by the Forest Products Co. Metal key ring fits close against the grooved end of the cast resin block and is fastened at the other end by a screw top

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4. All the essentials for home manicure fit compactly in individual sections of the smart molded plastic Cutex gift kit. Norton Laboratories, Inc., molded the case of Durez for Northam Warren Corporation

5. Gayly colored Zippo indoor clothes line reels lift the wash-day gloom. Molded of Lumarith by Columbus Plastic Products, Inc., they match the modern kitchen or bathroom. The reel is self-winding and because plastic will not rust, the line can be reeled while damp—grand for travel

6. Plastics provide safety, sanitation and good looks for the Zenith Thermique permanent waving machine. Each waving cord is tipped with a heat-resistant, shockproof phenolic clip. Ivory Beetle knobs contrast with the black Bakelite control panel The translucent laminated Insurok nameplate is lighted from within. Design is by Barnes & Reinecke

7. To end plant pests, Magic Garden Hose Sprayer discharges a solution made of a water-dissolved insecticide or fungicide cartridge. Cartridge chambers, injection molded of transparent Tenite by Bay Mfg. Co., are attached between a hose shut-off and the extension nozzle of the sprayer

8. Dainty and neat in appearance the Yardley atomizer, designed by Ralph W. Wilson, features plunger action, permitting one-handed operation and more accurate control of spray volume. Varied design and colors are available. Plastic parts are molded by Mack Molding Co. and Winchester Co. supplied the metal parts and assembly

9. Dry, free-flowing salt and pepper are insured by the snug arrangement of Non-Klog shakers. Little colored globes, each with a hollow opening at the base, set tightly over small cones on the stand. Spice is put in, or shaken out of, the ball through a tiny hole at the point of the opening. Columbia Protektosite Co., Inc., make them of Plastacele

10. Triple-threat perfume display stand holds 3 bottles and will accommodate bottles of 3 different designs. Contrasting colored top slides on metal frame to permit easy removal of perfume. Boonton Molding Co. molds the plastic parts of Tenite for Irresistible, Incorporated

11. Oval-shaped, easy-to-grip Gillete Dry Shaver has a smooth Textolite housing molded in two parts by General Electric Co.'s Plastics Dept.

Manufacturers' addresses will be sent if you will write to the Editor enclosing 3-cent stamp for reply

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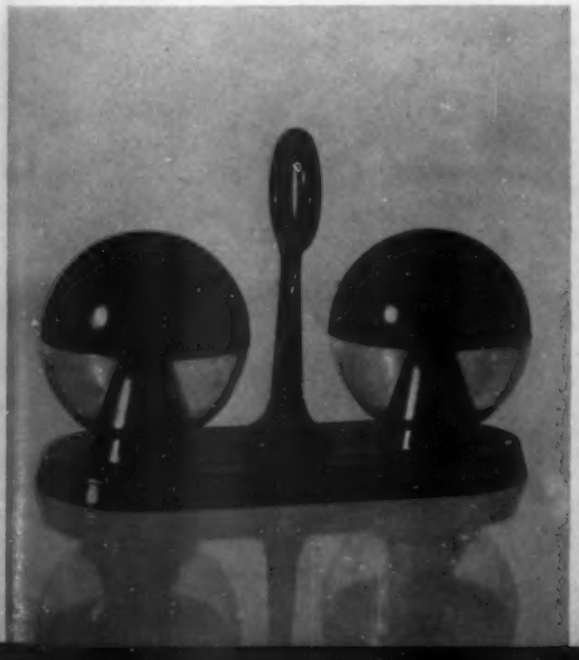

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12. For simple rapid alteration of home lighting fixtures, the modern Adapter Unit combines a 10 in. molded urea reflector with a complete socket attachment which can easily be screwed in without installing new electrical equipment. Lightweight, the shade is suspended by a chain directly from the socket. Molded of Beetle by Bryant Electric Company

13. Transparent Textolite teat cups resist corrosion caused by lactic acid in milk, withstand daily washing with lye disinfectant, and allow dairymen to watch the milking operation. Used on Clean-Easy Portable Milkers, plastic parts were molded by General Electric's Plastics Dept. for Ben H. Anderson Company

14. Strong and tough, smooth in finish, lightweight, cellulose acetate is well adapted to endure the shock and hard usage to which gun butts are subjected. Both the end plate and trigger guard on the Mossberg Repeater rifle are made of Tenite for rough wear. Plastic Molding Corp. did the molding

15. Redesigned in modern flowing lines, the large Scott paper towel dispenser is molded of black Bakelite by Boonton Molding Co. Color goes all the way through, is permanent and there is no rusting or peeling problem

16. Held at any angle, the Seagram liquor dispenser top will pour in an even controllable flow. The cap, at the pouring head, forms an air-tight covering when the bottle is not in use. H. H. Martin Products Corp. makes it of three Plaskon parts molded by Closure Div., Owens-Illinois Glass Co. Tasteless, odorless, the material will not affect flavor

17. Smartly styled Robinson Pen-in-Ink set stores ink in a Catalin-covered hard rubber base. Adjustable pen socket is set in a colored dome. Plastic Turning Co. fabricates the cast plastic case and Vulcanized Rubber Co. molds the ink reservoir base. Design is by George Voges

18. Cool looking beverage glasses, six feet tall, complete with straws, ice cubes, fruit and mint leaves, were made of clear sheets of Monsanto Vue-Pak for eye-catching window display of Gay Gibson frocks, at Kline's, Inc. Custom built for Gernes Garment Co., the plastic glasses were fabricated by Central States Paper Company

19. Glowing opalescent effect of the Norge nameplate adds distinction to the severe efficient lines of this refrigerator. Chicago Molded Products Corp. molds this of Lumarith

Manufacturers' address will be sent if you will write to the Editor enclosing 3-cent stamp for reply

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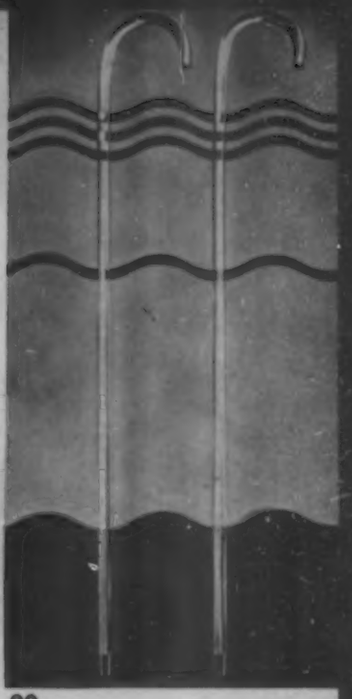

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20. Handsome, crystal-clear methyl methacrylate canes are formed from Plexiglas rods thabent, under heat, into graceful shapes. W. L. Oppenheimer is the fabricator

21. Professional looking titles, uniform captions and ornaments on home movie films, may be simply produced with the Wood-Regan lettering set. Guides, design triangles, and drawing board straightedge are made of Pyralin cellulose nitrate. An especially designed lettering pen has a handle of the same plastic

22. Practically unbreakable, smooth clear watch crystals in a wide variety of shapes and sizes are molded of Bakelite polystyrene by Boonton Molding Company

23. For thrifty smokers who wish to snuff out a half-smoked cigaret and relight it later, Dr. Paul E. Bennet evolved the Ciggie Saver ash tray. Red, green or black Durez bases, molded by Peerless Molded Plastics, Inc., blend with gold, silver or chromium plates

PLASTICS IN REVIEW

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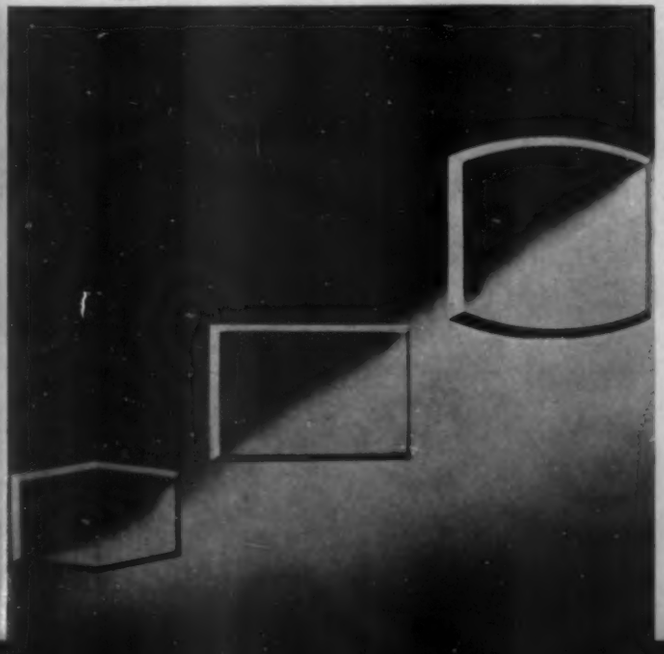


23

Time made more

AMONG ALL ITEMS classified as jewelry, only the watch of reputable make offers its owner a practical service combined with the pride of possessing a masterpiece in jewelry craft.

And *that* is the reason why a fine watch is one of the most appreciated of all gifts. When the famed house of Gruen brought out its "Newest Wrist Watch in the World!", a package worthy of this achievement was sought. And Molded Plaskon was selected as the material for this container, for many reasons.

First of all, Molded Plaskon offered true reproduction of the handsome Gruen designs that had been carefully selected – offered clear, uniform, fadeless colors of unique brilliance and infinite variety.

Then, too, Molded Plaskon is smooth and warm to the touch. Though light in weight, it has great strength – will not chip, corrode, rust or tarnish. Its surface is hard, easy to keep clean. Water, oils and organic solvents will not stain or otherwise affect the beauty of Molded Plaskon. Being solid molded color, the finish is permanent. Neither scratching nor abrasion impair its color value.

These are but a few of the many distinctive qualities that have made Plaskon the world's largest selling urea-formaldehyde plastic – and one of the most versatile.

Buttons and Buckles – Bottle Caps – Cosmetic Containers – Handles, Knobs and Dials for Motor Cars, Radios, Electrical Appliances – Lighting Reflectors – Switch Plates and other Electrical Wiring Devices – Toys and Novelties – these represent only a fraction of the wide variety of applications to which Plaskon has been adapted successfully and with profit.

Can Molded Plaskon improve *your* product? Maybe that can be answered best by a conference. A letter or wire will bring a Plaskon representative, quickly. No obligation!

PLASKON COMPANY, Inc.

2121 SYLVAN AVE. • TOLEDO, OHIO

Canadian Agent: Canadian Industries, Ltd., Montreal, P. Q.

precious by PLASKON

Richness of design and color distinguish these Plaskon-molded Gruen containers. The top unit measures 5⅜" x 3⅜", and the bottom unit measures 10⅛" x 2¼". Both are hinged with the Rathbun spring hinge. Color of the containers is an especially formulated Gruen Blue, vivid and deep-toned. The Rathbun Molding Corp., Salamanca, N. Y., is the molder.

Trade Mark Registered

PLASKON

★ MOLDED COLOR ★

PRESENTATION DINNER

IN AN ATMOSPHERE OF "GAY NINETIES" CONviviality, the Award Winners in the Fourth Annual Modern Plastics Competition were honored at a dinner held November 14 in the Starlight Roof of the Waldorf-Astoria Hotel, New York, N. Y. Over 350 guests, including representatives of many companies using, manufacturing, designing, molding and fabricating plastics were present.

Thirty-six companies received major awards and twenty-six obtained honorable mentions in the competition in which 800 entries were received. After a dramatic display and exhibit of the prize winners, 126 molded plastic plaques and 38 certificates were presented to those companies, designers, machinery suppliers, manufacturers, etc., whose product or services entered in any way into the production of the entries which won awards in the Competition.

Following the dinner, C. A. Breskin, publisher of Modern Plastics, welcomed the guests and E. F. Lougee, editor, introduced those at the speakers' table which included beside the speakers and judges: Dr. Paulo Carniero, Technological Institute of Rio de Janiero; Watson Davis, editor of Science Service; Donald Dew, president of the Society of the Plastics Industry; Allan Fritzsche, chairman of the S. P. I. board of directors; W. H. Gardner, Brooklyn Polytechnic Institute; Dr. Gordon M. Kline, director of the Plastics Div., U. S. Bureau of Standards; A. P. Peck, Scientific American. Harvey Wiley Corbett, architect and designer, spoke for the judges, explaining the selection of winners and pointing out the wide future of plastics because of their versatility as functional materials well adapted to modern engineering and design.

Tracing briefly the history and growth of the plastics industry, E. F. Lougee, editor of Modern Plastics, discussed the modern developments in plastics as exemplified by the Competition Winners. Mr. Lougee then introduced the speaker of the evening, Dr. James Shelby Thomas, president of the Chrysler Institute of Engineering. Dr. Thomas is also president of the Clarkson Institute of Technology, Potsdam, N. Y., a past District Governor of the Rotary International, a member of the National Educational Association and the American Academy of Political and Social Science.

"With the use of science, and the scientific methods of doing the drudgery of the world," Dr. Thomas said, "masses of men have been given leisure time for cultural hobbies and recreational life which men have never before enjoyed." He congratulated the plastics industry for producing "new uses for old (*Please turn to page 80*)

Stock Molds

SHEET EIGHTY-NINE

Valve handle wheels, knobs, bottle closures, novelty beer scrapers and thimbles are available without mold cost from stock molds. Address Stock Mold Department, Modern Plastics, Chanin Building, New York, N. Y., giving item and sheet numbers

---

997. Valve handle wheel, 2 5/8 in. in diameter. Ribbed edge for easy grip. Available in colors, with or without inserts

998. Valve handle wheel, same as above, but 1 7/8 in. in diameter

999. Valve handle wheel, same as above, but 2 1/4 in. in diameter

1000. Valve handle wheel, same as above, but 3 in. in diameter

1036-37. Beer scrapers, in mottled, clear or solid colors, 9 in. by 1 1/8 in. by 1/10 in. thick

1038. Threaded 18 mm. bottle cap with ribbed edge. Overall diameter 7/8 in.; inside diameter 11/16 in.; 1/2 in. high

1039. Threaded 22 mm. bottle cap with ribbed edge. Overall diameter 1 in.; inside diameter 15/16 in.; 1/2 in. high

1040. Assembly dropper in 1/4, 1/2, 1 and 2 oz. capacities. Size of cap, 18 mm.; 7/16 in. high; 11/16 in. inside diameter; 7/8 in. overall diameter; 1/2 oz. pipette, 2 3/8 in. long

1041. Ball cap 18 mm. bottle closure; 3/4 in. in diameter, 1 in. high. Also available in 10 mm. size

1042. Knob with 3/16 in. threaded metal core. Overall height, 7/8 in. Diameter of top 7/8 in.; diameter of base 3/4 in. Available with or without inserts and with various style metal cores

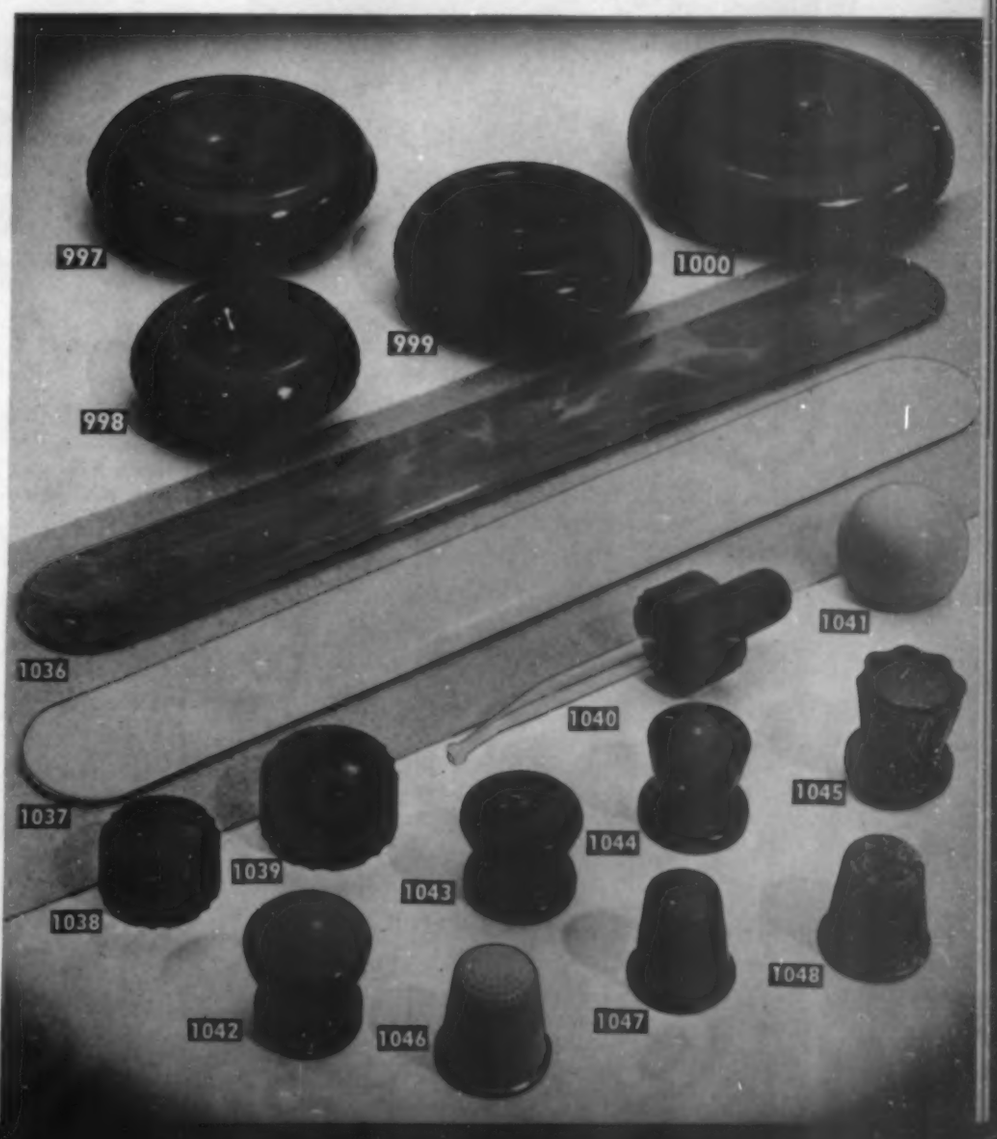
1043. Knob with 5/16 in. opening. Diameter of top 7/8 in.; Diameter of base 13/16 in. Overall height 13/16 in. With or without inserts and with various style metal cores

1044. Knob same as 1043, but 3/4 in. in diameter across top

1045. Fluted knob with 3/16 in. metal threaded extended core. Diameter of base and top, 13/16 in. Available with different cores and with or without inserts

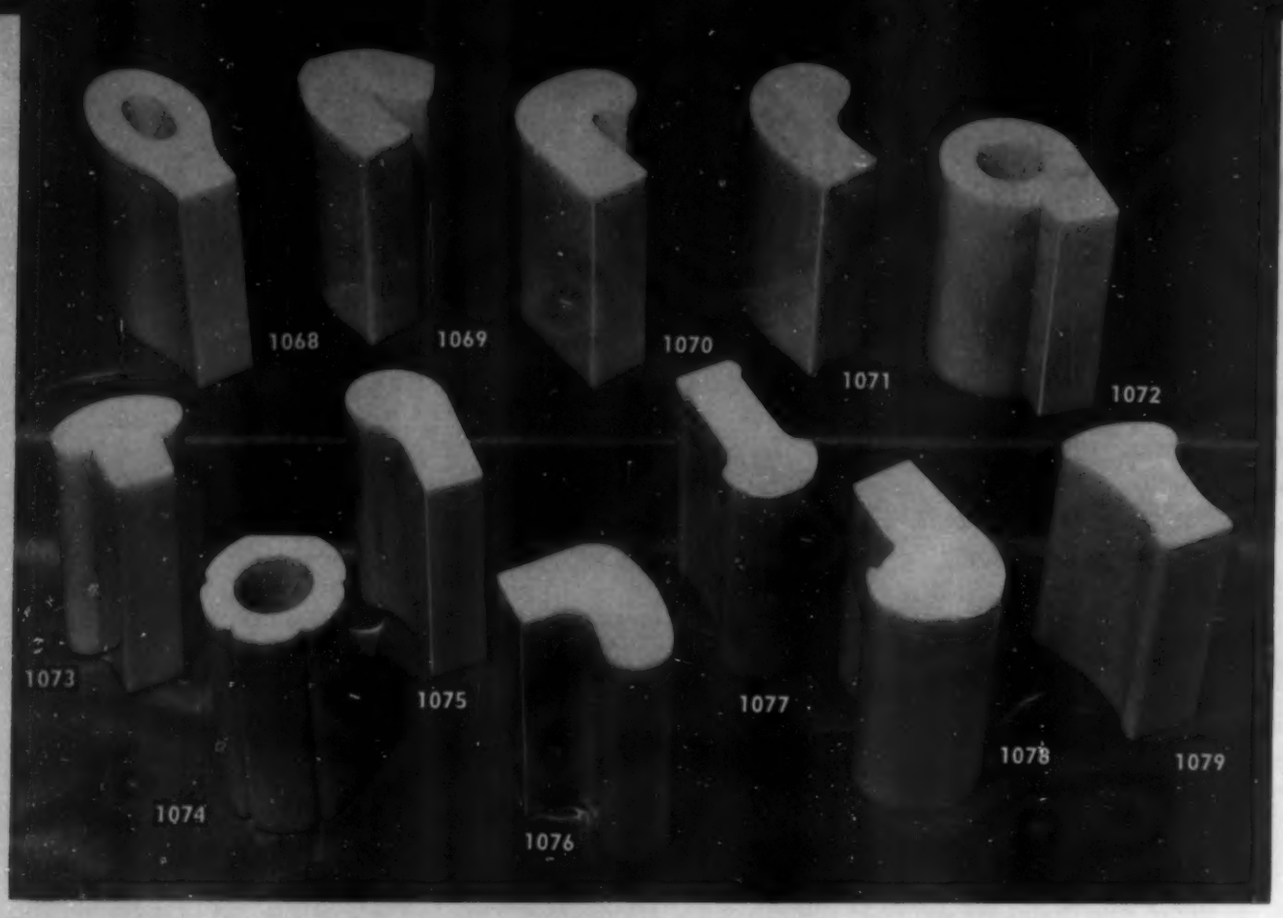
1046, 1048. Thimbles in solid or mottled colors. Overall height, 13/16 in. 13/16 in. diameter at base

1047. Thimble, 3/4 in. in diameter; 7/8 in. overall height



All molders are invited to send samples from stock molds to appear on this page as space permits

Sheets One to Fifty-Two reprinted in book form, Twenty-Five cents in coin or stamps



Reprints of sheets One to Fifty-Two, Twenty-five cents in coin or stamps

Cast Resin Forms

SHEET NINETY

These forms, in various colors and degrees of translucency are supplied in the cross sections shown, in weights and lengths indicated below. They may be fashioned into finished articles by sawing, slicing, or grinding them into shorter lengths which are then buffed or polished. Umbrella handles were made from these but many other applications are possible. Names of molders will be supplied on request.

1068. Handle, 3 5/8 in. high; 1 in. across straight edge. Diameter across curved end, 1 3/4 in. Opening 1 3/8 in. vertical diameter by 11/16 in. The form as a whole weighs 1.7 lbs. and is 8 in. long

1069. Handle with ridged top. 2 3/4 in. overall height; 1 1/16 in. at base; 2 3/8 in. across widest part. The form as a whole weighs 2.5 lbs. and is 11 7/8 in. long

1070. Handle, 3 in. overall height; 1 1/8 in. at base; 1 3/4 in. along inside straight edge; 2 1/4 in. across curved end. Form weighs 2.9 lbs. and is 12 in. long

1071. Handle, 2 7/8 in. overall height 1 1/8 in. at base; 2 in. across widest part. Form weighs 2.4 lbs. and is 12 in. long

1072. Handle, 2 3/4 in. overall height; 2 3/16 in. at widest part with opening 1 1/16 in. in diameter; 1 in. at base. Form weighs 1.5 lbs. and is 8 in. long

1073. Handle, 1 15/16 in. overall height; 7/8 in. at base; 2 in. in diameter at widest part. Form weighs 1.5 lbs. and is 12 in. long

1074. Fluted round handle, with a 1 in. flat base. Outside diameter, 2 in.; 1 1/8 in. center. Form weighs 6 lbs. and is 6 in. long

1075. Handle, 2 5/8 in. overall height; 7/8 in. at base; 1 3/8 in. across curved end. Form weighs 1.7 lbs. and is 12 in. long

1076. Handle, 1 7/8 in. overall height; 1 in. across straight edge. Diameter of curved end, 2 3/8 in. Form weighs 1.9 lbs. and is 12 in. long

1077. Handle, 2 7/8 in. overall height; 15/16 in. at base; 1 1/2 in. across curved end. Form weighs 1.7 lbs. and is 12 in. long

1078. Handle, 2 7/8 in. overall height; 1 in. across straight edge. 2 in. across curved top. Form weighs 2.3 lbs. and is 11 7/8 in. long

1079. Handle, 2 7/16 in. overall height; 1 1/8 in. at base; 1 5/8 in. across widest part. Form weighs 1.7 lbs. and is 12 in. long

VULCANIZED-FIBER-PHENOLIC TUBES IN HIGH VOLTAGE ENGINEERING

By GERARD A. ALBERT*

PLASTICS IN THEIR PRESENT-DAY USES ARE many and varied in form and method of manufacture. Some materials not ordinarily classified as plastics predate by a great many years these better known new forms. One seldom thinks of vulcanized fiber as being in this category of materials, yet it is one of the oldest plastics made of chemically converted cellulose. Vulcanized fiber was offered to the industry following the granting of the first patent in 1859.[1] It was not until 1904 when our first continuous fiber mill went into operation, however, that fiber really found its place in industry. Today it is used in practically all industries both for mechanical and electrical applications.

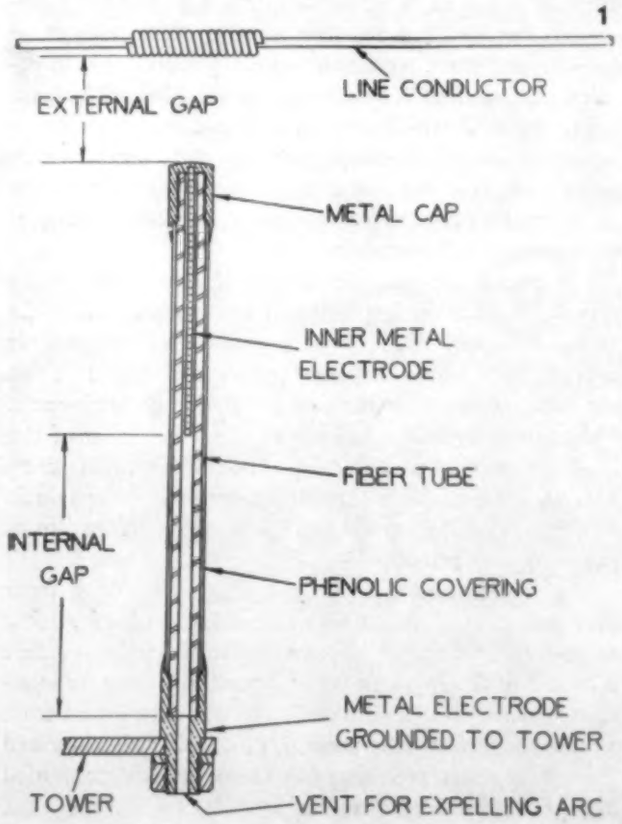
Recent developments have resulted in the incorporating of this old plastic, vulcanized fiber, with the relatively young material, laminated phenolic, to make a product of particular value for high voltage applications. Within the past seven years tubes made with fiber liners and phenolic covering, known as combination tubes, have attained a place of distinction in protective devices of electrical equipment and insulators on transmission and distribution lines. Their use in this connection is in the manufacture of expulsion type protective devices. These tubes consist fundamentally of fiber tubes covered

* Engineer, National Vulcanized Fibre Co.

[1] *Increasing the Strength of Paper.* British Patent 787 to Thomas Taylor.

Cross sectional view of a combination Phenolite-fiber tube used as a lightning arrester (1) shows construction of an expulsion protective gap. Fig. 2 pictures a typical installation of a tube on 13.8 kv double circuit line. (Photos, courtesy General Electric Company)

1



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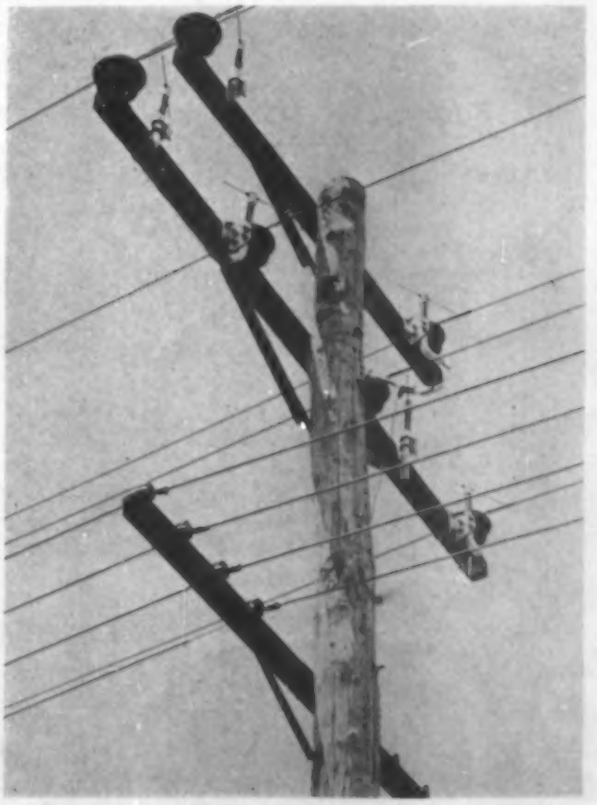

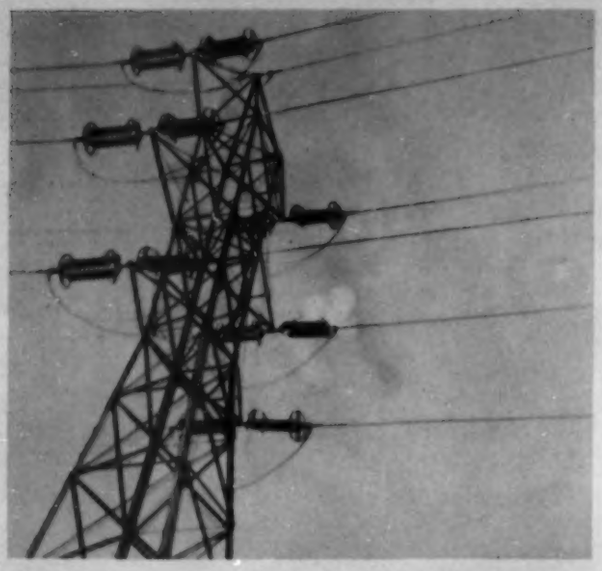

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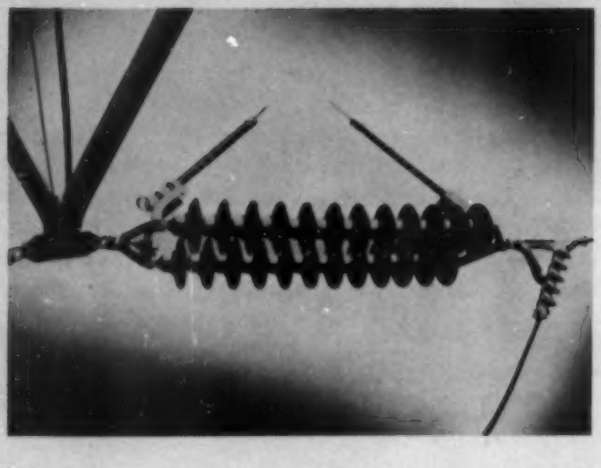

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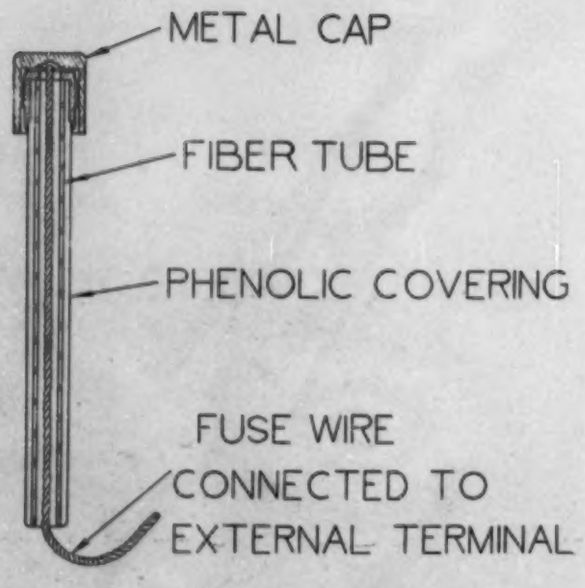

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Field tests show gases being expelled from G-E's expulsion gaps, (3) which have been mounted across double-dead-end strain towers (4). These gaps are interrupting approximately 1400 amperes at 132 kv. Fig. 5 is a cross sectional view of a fuse cut-out device. (See photos opposite page)

with laminated phenolic material, usually of paper base. They are used in quantities for both lightning arresters and fuse cut outs. In this article their principle of operation, construction and applications are discussed.

Theory of Arc Extinction

An air space supporting an arc is conducting because it is ionized. To extinguish the arc the gas must lose its ions and regain its dielectric strength. An ionized gas will normally lose its ions if left to itself because the oppositely charged ions combine to form neutral molecules. This natural recombining of ions in an arc stream is too slow, however, for practical use in lightning arresters and fuse tubes, etc., and other means for accelerating this recombining are resorted to.

For a gas to remain conducting or ionized against the normal recombination of ions an ionizing agent or producer of ions is necessary. In an electric arc the voltage gradient along the arc and the current flowing in the arc are excellent producers of ions or arc sustaining particles. In an A.C. (alternating current) arc with which we are concerned, at zero current and hence zero voltage (the current and voltage of an arc are usually in phase) the ionizing action momentarily ceases while the deionizing action, due to the natural recombining of ions, continues unabated. The voltage necessary to carry the arc into the next half cycle must then be much higher than that required in the previous cycle. If deionizing has not progressed too far, the line voltage will be sufficient to reignite the arc for another $^1/_2$ cycle. If, however, deionization has progressed so far that the line voltage cannot restrike the arc it will remain extinguished.

The present practical means for accelerating the rate of deionization is to bring surfaces of solid insulating materials close to the arc so that ions may collect on these surfaces and there recombine to form neutral gas molecules. It was found, however, that the kind of the insulating material which is brought close to the arc has a big effect on extinguishing the arc. A material which will decompose into a neutral gas under the heat of the arc is much more effective than a refractory material such as glass and porcelain.

Vulcanized fiber was found to be ideal as an insulating material which decomposes and forms a gas under the action of an arc. The gas which is evolved by the arc is neutral, that is, un-ionized, produces a turbulence in the tube, mixes with the ionized air in the arc stream, and thereby greatly accelerates the recombining of the ions to form neutral molecules. In addition, this generated gas blows the ionized air from between the terminals of the tube to the outside. This action is referred to as the expulsion principle.

It is interesting to note that the gas formed from fiber was examined and found to consist of 50 percent carbon monoxide, 45 percent hydrogen and 5 percent mixture of hydrocarbons. A small quantity of condensed water was also found. It was also noted from tests made in fiber fuse tubes, $^1/_2$ in. inside diameter and 1 in. long, that 2500 amperes at 60 cycles decomposed 0.25 gr. of fiber per $^1/_2$ cycle of arc.

General Construction

Expulsion tubes were put in service for the first time in 1932. These first tubes were made entirely of fiber but after three years of service it was found that some means would have to be devised to protect them from the weather. As a means of protection the fiber tubes were telescoped inside of phenolic tubes. This procedure resulted in poor bond between the fiber and phenolic tubes and in many cases the fiber liners fell out. After considerable work a method was developed whereby a phenolic covering could be rolled on the fiber tube thus making it an integral part of the fiber liner. To do this without injuring the electrical and especially the mechanical properties of the fiber tubes required much thought and experimentation.

Present designs of combination tubes vary considerably. The inside diameters of some tubes are as small as $^{3}/_{16}$ in. while the outside diameters of other tubes are as large as $3^{1}/_{2}$ in. The total wall of these tubes including both the fiber and phenolic covering have varied from $^{1}/_{32}$ in. to $1^{1}/_{4}$ in. In many cases where heavy-walled tubes are wanted the greater part of the wall is fiber while the outside phenolic covering is usually $^{1}/_{16}$ in. or $^{1}/_{8}$ in. thick. If the wall of the fiber portion is large, one or more fiber tubes are slid into each other, that is, telescoped to make the desired wall of fiber. Such heavy-walled-fiber tubes are usually used as lightning arresters on lines above 100 kilovolts.

There are two other properties of vulcanized fiber besides its neutral-gas-forming property which make it particularly suited for use in expulsion tubes. One of these is its impact strength. Fiber under steadily applied stresses has strengths comparable to those of many other organic insulating materials but its impact strength or shock resistance is from 3 to 7 times greater. Hence, the fiber liner in the combination tubes is well able to resist the internal impact stresses set up by the spontaneous generation of the gas.

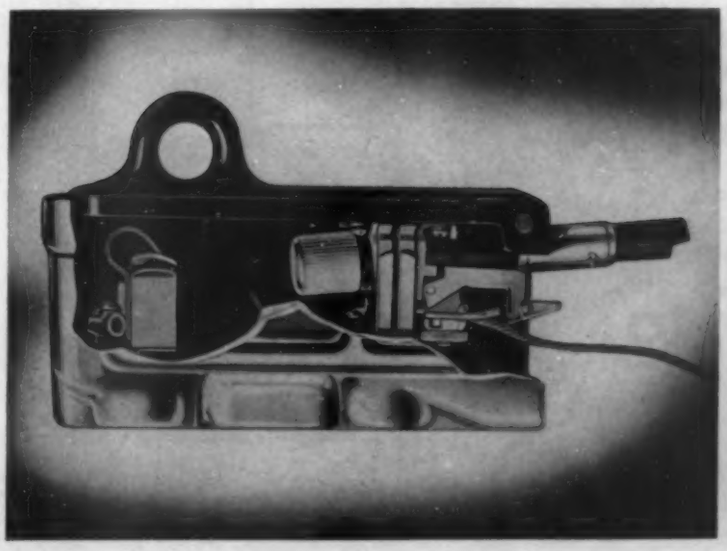
The third property of fiber which makes it indispensable for arc-extinction applications is its non-tracking property. When an arc plays on fiber it volatilizes completely without leaving any carbon deposit. The fiber liner following an operation is just as good as it was before. As many as 10 discharges of 100,000 amperes each have been sent through a combination expulsion tube without leaving traces of carbon on the exposed surfaces.

If the internal impact stresses which results from the generation of gas are too great the tube will burst, and if not enough gas is formed, the power arc will continue without extinction, with the result that the tube eventually fails. Thus it is seen that expulsion type tubes have maximum and minimum current ratings.

A recent report of the General Electric Co. included the statement that phenolic covered tubes have excellent weathering characteristics and are free from warpage, but organic materials cannot, of course, be expected to have a life comparable with such inorganic materials as glass or porcelain. Refinishing the outer surface of these tubes periodically with weather-resistant paint will increase the weather resistance, although examination of tubes from both service and accelerated life tests have indicated that the phenolic portion retains its dielectric and mechanical properties when subject to the weather under normal conditions, and that refinishing of tubes is not essential. There is, of course, a slight discoloration of the phenolic wrapping after the original finish disappears but a careful check-up has shown that this condition is neither harmful to operating characteristics nor injurious to the durability of the composite vulcanized-fiber-phenolic-laminated tube. (*Please turn to page 71*)

Combination Phenolite-fiber tube mounted in a fuse cut-out device (6) is pictured extending partially out of the housing. The fuse link, blown out by excess current, severed the trip mechanism which released the tube. Another type of drop-out tube, not enclosed in a housing, is shown (7) in closed position. (Photos, courtesy Line Material Company)

6



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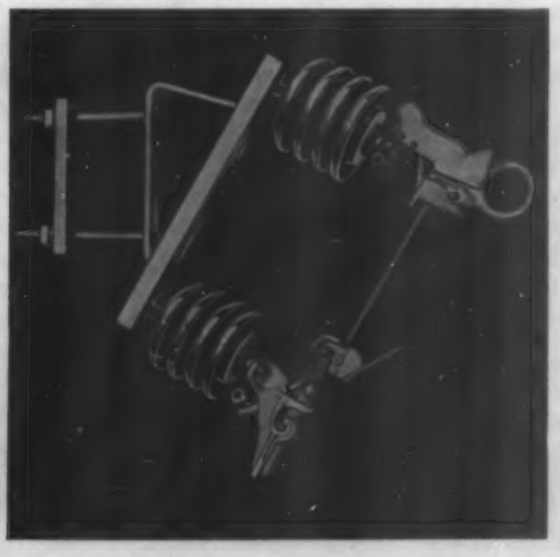


INJECTION CYLINDER UNIT

by W. H. SCHWARTZ*

THE HEART OF ALL INJECTION MOLDING MAchines is the chamber in which the granular material is thoroughly plasticized and then injected into the mold cavities. The three outstanding design features of this unit are as follows:

1. Preheating, plasticizing, and maintaining plasticity of the material as it passes through the different chamber sections.
2. Construction simplicity of the injection cylinder unit sections.
3. Stress resistances of the injection cylinder sections that are subjected to extreme pressures.

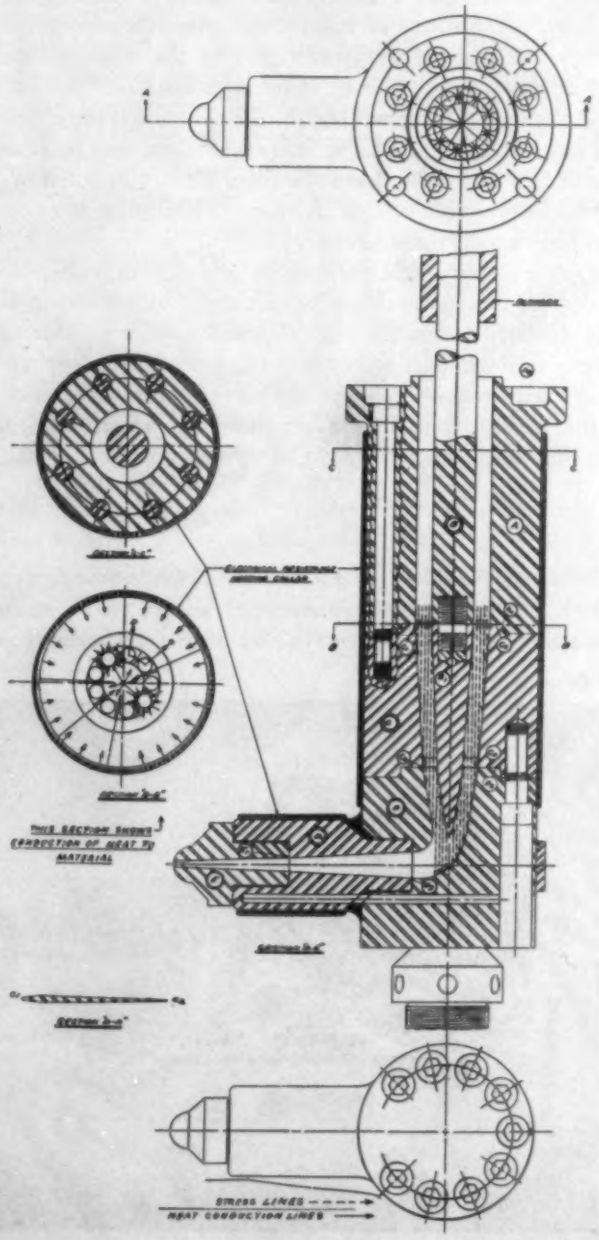
Considerable thought, study, and comparison were given before an injection cylinder unit was designed to fully incorporate the above-mentioned features. Fig. 1 is a general cross sectional view of an injection cylinder unit (patent pending) which is ideal in fulfilling the most severe requirements which must be satisfied so that any of the existing thermoplastic materials can be successfully injection molded.

Heating and Plasticizing

Referring to section *A-A* of Fig. 1, the granular material is first fed through a feed cup into an annular cylindrical chamber in which it is subjected to a preheating process. This chamber is formed by cylinder *A* and shaft *B*. Section *C-C* is a cross sectional view giving a clear description of the concentricity of *B* to *A* which forms a uniform annular ring of material throughout the length of *A*. A plunger, shaped to fit in the annular space formed by *A* and *B*, descends by means of a hydraulically actuated attachment. The material, previously preheated and semi-plasticized, is then forced into the spreader section *C*. The spreader section consists of a series of holes, drilled longitudinally to the axis of the spreader. These holes are equally spaced to coincide in exactment with the annular formed chamber of cylinder *A*. The shape of the metal section between the holes is illustrated by section *D-D*. The spreader section is so termed and constructed because it serves the purpose of spreading equally the semi-plasticized material within itself, thus dividing the material in its holes and also exposing the material to a greater and more uniform heat concentration. The description of section *C* can be verified by referring to section *B-B* of *C*. The semi-plasticized material upon entering spreader *C*, displaces an equal volume of previously plasticized material from section *C* to *D*, from *D* to *E*, and from *E* into the cavity of the mold.

Heat is applied to material in sections *A*, *C*, and *D* by conduction from electrical resistance heating collars. These collars contact the outside surfaces of the sections to be heated and thus the heat is conducted to the material. The material in the annular cylindrical space is heated evenly on contacting the internal wall of *A* and the lateral surface of *B*. The heat is transferred to the surface of *B* by means of conduction from the outside surface of section *C*, through the metal sections between the spreader holes, to the center of this section through solid shank of *B*. Heat is likewise applied to material in spreader holes. The material passes through a stage of being thoroughly plasticized because of the

Fig. 1



* Chief Engineer, Lester Engineering Co.

uniform heat concentration along the entire lateral surfaces of the spreader holes. The heat transfer from the horizontal heater and vertical heater joins at the exposed elbow chamber in section *D*. Sufficient heat is transferred to maintain uniform plasticity in the elbow.

It will be noted that the plasticized material lies in a converging cone shaped elbow and horizontal chamber *D* of the continued shape. This design is necessary in order to eliminate the holding temperature of too great a mass, thus minimizing burning or decomposing of material. It will also be noted that excessive heat concentration in the elbow of section *D* is entirely eliminated because of radiation and contact losses due to the exposed and contacted surfaces. If the surfaces of section *D* were covered with insulation or an electric collar heater, a surplus supply of heat would concentrate in the elbow causing the material to burn. It is, therefore, an advantageous design feature for an injection cylinder unit to consist of an intermediate uncovered section which separates the process of plasticization of section *C* and maintaining plasticity of sections *D* and *E*. The uniform heating of the three stages, Preheat, Plasticizing, and Maintaining Plasticity, minimize the possibilities of materials burning and decomposing thus providing an injection cylinder unit that can continuously produce a maximum amount of homogeneously plasticized material per hour.

The required pressure, which the plunger exerts on displacing the material in the injection cylinder unit, is dependent upon the resistance that the material offers against the material contacting surfaces of sections *A* and *B*, the holes in section *C*, and the surfaces of the elbow and prolonged tapered hole of section *D* and *E*. The thoroughness of heat applied to the preheated and plasticized material is also an important factor in material pressure resistance offered to the material flow. The annular passage formed by *A* and *B* minimizes the restriction offered when the preheated material is spread into the spreader holes of section *C*. The section, *D-D*, illustrates the streamlined metal section between the spreader holes. This is necessary in order to help break up the material at point *C* and allow a natural flow to point C_2. Referring to sections *C*, *D*, and *E* the spreader holes gradually converge into an elbow and continue to the end of section *E*. This design aids the natural flow of the plastic material and also minimizes the resistance offered to the applied plunger pressure. The practice of converging the flow of material in an injection cylinder insures the possibility of injecting homogeneous plasticized mass into the die cavity. The adaptation of the above principles in the injection cylinder design has proven definitely to minimize the pressure resistance offered to the plunger on injecting the material. Therefore, a greater percentage of the total applied pressure is utilized in molding the material in the die.

Construction features

Referring to section *A-A*, it will be noted that the injection unit is divided into three main sections:

1. Section *A* which is a hollow cylinder in which a female seat A_1 is opposite its flange A_2.
2. Section *C* consisting of a series of holes converging to a point. These holes are also illustrated in views *B-B* and *D-D*. Male seat C_3 must fit snugly and exactly into seat A_1 of section *A*. Also an exact fit must be made with female seat C_4 to seat D_2 of section *D*. Screwed securely into section *C* is shank *B*. This is made possible by an intermediate stud which is locked into place by pressure exerted on ball B_1.
3. Section *D* consisting of a cone shaped passage converging around an elbow to joint D_2 and then continuing to taper through sections D_1 and *E*. Section *E* is screwed into D_1 and snugly jointed at E_1. Section D_1 is screwed and welded into section *D*. Joint D_2 is thus made permanent.

It is extremely important that all sections be made to coincide exactly at their respective joints. If this factor is overlooked, material would lodge and burn at these points thus discoloring the material and clogging the cylinder passages.

It is obvious from the illustrations that the joints and sections have been extremely minimized. Ease in disassembling and reassembling the unit is also obvious. Precision machine work can be very easily performed. The sections are made interchangeable by use of jigs and plug gages. The required high polish and perfect chrome-plating are also made possible by the simple construction. This is all very important in maintaining a continuous successful injection of the various types of thermplastic materials.

Stress considerations

The importance of stress analyses has been fully realized in the design of the described injection cylinder unit. The wall thickness of section *A* is determined to resist internal pressures offered by the semi-plastic and plastic materials when under pressure and heat. On referring to the top view of section *A-A*, note the socket head screws which are equally spaced through the cylinder wall. The screws secure the seat, A_1 of section *A*, snugly onto seat C_2 of section *C*. This method of assembly makes it convenient to disassemble *A* from *C* when it is necessary. When pressure is applied on material from plunger, part *C* and part *D* is subjected to a great pressure which tends to separate these sections at their common joint C_4 and D_2. The total applied pressure is reduced considerably by converging holes in spreader *C* to coincide with cone opening in section *D*. Referring to section *A-A*, the total plunger forces, the direction of which is illustrated with arrows, are greatly reduced by counteracting forces created in section *C*. The remaining forces not counteracted are effective in separating sections *C* and *D* at joint C_4 and D_2. Referring to the bottom view of *A-A*, it will be noted that socket head screws of sufficient number and size are used in securing *C* to *D* to resist the effective parting forces. The socket head screw is made (*Please turn to page 84*)

CARTERITE PROCESS FOR MAKING RESIN BOARDS AND BLANKS

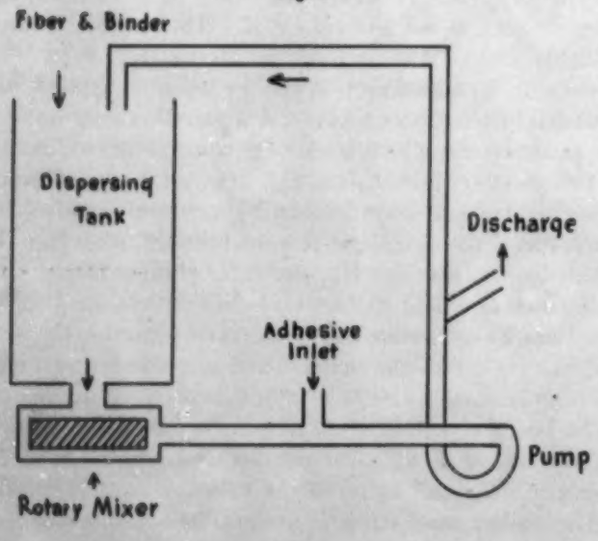
by RICHARD B. LANDRIGAN and HENRY ROSECALN

LAMINATING CONSISTS IN COMBINING RESIN-impregnated sheets of paper in a press under heat and pressure. In impregnating paper, sheets are dipped into an alcoholic solution of resin. The paper, running on rollers into the bath, is then conveyed to drying towers, the process being continuous. Although comparatively simple in principle, impregnation embodies certain disagreeable features. By reason of its adhesiveness, the resin is liable to adhere with detrimental effect to parts of the machinery used in making the product. Particles of different specific gravity suspended in the liquid vehicle tend to concentrate in a stratum instead of being distributed throughout the mass of pulp, or these particles leave the product with the vehicle when the liquid is drained off. The drying entails large expenditures on specially constructed driers; the problems of solvent recovery and, of course, fire hazard are always present.

The Carterite process eliminates these undesirable impregnating features by use of a special method. It is the purpose of this article to show how such a process produces more easily and more economically articles from raw materials which are more readily handled than resin-impregnated paper.

The method consists, briefly, of mixing paper pulp with a colloidal emulsion in which the dispersed phase is a resin and the continuous phase is a colloid capable of coagulating to a firm gel enveloping the dispersoid. The emulsion is subdivided into particles small enough to give the proper distribution throughout the paper stock when added to the beater. Fibers are also bound into the emulsion in such manner as to protrude from the particles into which it is divided, forming tentacles which entangle and felt together with the paper furnish, preventing the particles of dispersoid from being carried away with the waste water.

Fig. 1



The apparatus for the production of a dispersion of fiber, binder and adhesive is outlined in Fig. 1. The fiber and binder are put into the dispersing tank and recirculated until well mixed. As the mixture circulates through the apparatus the adhesive is slowly added until a homogeneous paste is produced. The fiber may be any material such as cotton, duck, etc. The adhesive may be any common material such as starch, resin, latex, gums, tars, soaps, waxes, oils, or any waste product of industry having adhesive powers. Present practice of manufacture utilizes paper or asbestos fibers, xanthate binder and phenolic resin as an adhesive.

When the emulsion is ready for making board or blanks, it is beaten with an additional quantity of fiber in a paper beater and the mixture is sheeted out on a wet paper machine to any desired thickness or size and air dried. The sheets are then pressed into board. If blanks are to be made, the stock is run from the beater to a pick-up mold where the stock is sucked into any desired form. The blank is then dried, spray coated and pressed to the desired shape.

The advantages of this method as compared to laminating are:

1. One piece used versus numerous sheets.
2. Better flow of *A* stage resin covering each fiber versus *B* stage resin set in drying.
3. No sticking to machinery versus sticky resin baths and paper which adheres to machinery.
4. No special driers or machinery versus dipping baths, driers and solvent recovery system.
5. Aqueous medium versus alcohol as solvent.
6. Even distribution of resin throughout sheets versus resin on surface.

The blanks can be made in different shapes and molded into products where exceptional strength and beauty, at no extra cost, is desired. A new and promising application of these blanks is in molded serving trays. They possess strength, toughness and resistance to alcohol, water and acid, and in addition, may be had in numerous colors. This tray should receive a favorable reception from enterprising restauranteurs who are seeking fixtures to brighten up their establishments. Among other actual and potential applications of these resin boards and blanks may be mentioned latex dipping forms, resin plate for printing, wall boards, table tops, and automobile running boards, fenders and panels.

SYNTHETIC RESINS AS WATER SOFTENERS

The author of the accompanying article is engaged in research work on plastics in England. He presents herein a brief summary of an important contribution to water purification and selective extraction resulting from investigations carried on in the Chemical Research Laboratory of the Department of Scientific and Industrial Research.

WATER SOFTENING BY MEANS OF NATURAL base exchange materials or zeolites, which are inorganic materials (sodium aluminium silicates), is well known and thoroughly established. Outstanding advances have taken place in developing these materials during the past quarter of this century. Zeolites have the peculiar property of exchanging their basic sodium ions for the calcium and magnesium ions of the water and as a result the water when percolated through a zeolite bed emerges converted to zero hardness according to the soap test. The calcium and magnesium carbonates (temporary hardness) and the calcium and the magnesium sulfates (permanent hardness) react with the zeolite and the sodium ions of the latter are exchanged for the calcium and the magnesium ions. Consequently the zero hardness water contains the equivalent quantity of sodium bicarbonate and sodium sulfate, which do not combine with the soap although the water is definitely alkaline. The zeolite is eventually converted to calcium and magnesium aluminium silicates and when this stage is reached, a solution of common salt is passed through it to regenerate the material. The sodium of the common salt displaces the calcium and magnesium of the contaminated material, the latter forming soluble chlorides which run to waste in the spent brine and the action of the zeolite continues indefinitely.

The earliest zeolites were prepared by fusing together caustic soda, aluminium salts and sand. These were, in general, of good reactivity often equal to the removal of 5000 grains of calcium and magnesium salts calculated as calcium carbonate per cubic foot of the material before regeneration. The latter operation was, however, so slow that it often took as long for the regeneration as the actual softening. Consequently only natural zeolites were used to any great extent, which although of poor reactivity, having only a softening capacity of 300 grains $CaCO_3$ per cu. ft., were much more rapid in regeneration.

Next stage was the development of artificial zeolites of colloidal type which were more reactive than the natural zeolites having an average softening capacity of 8000 grains $CaCO_3$ per cu. ft. and were also quite rapid in regeneration. Main difficulty experienced with these inorganic artificial zeolites was their poor durability when water contained free carbon dioxide.

Very recently synthetic resins have been developed for water softening purposes as a result of the remarkable discovery made by Adams and Holmes at the Chemical Research Laboratory, Teddington, England, that the condensation products of certain polyhydric phenols with formaldehyde had the unique property of attracting cations from neutral or slightly acidic solutions in water and in alcohol. They also found the products obtained from the condensation of aniline with formaldehyde could adsorb anions from solutions. Such synthetic resins could be regarded as organic zeolites and could be advantageously employed for water softening and conditioning for both industrial and domestic purposes.

It is, of course, essential that these resins should be highly stable, hard, insoluble and infusible. It is also necessary that no organic material from the resins should pass into solution while they are functioning as water softeners and therefore the stability of such resins is absolutely essential.

Preparation of such highly stable, insoluble and infusible resins by the interaction of polyhydric phenols with aldehydes using a suitable catalyst has been described by Sir Gilbert Morgan. Phenols of the tannin type are highly suitable for this purpose, not only due to their comparative cheapness but because of their high reactivity which leads to very hard and highly stable resins. Quebracho tannin when heated with formaldehyde in presence of hydrochloric acid gives a gel which on drying at 120 deg. C. produces a resin which is insoluble in all the known solvents and even in alkalis. Prior to use as a water softener, the resin is ground, washed first with acid and then with distilled water when it becomes ready to undertake its duties.

Silica zeolites have the property of base exchange, whereas, the organic zeolites exchange hydrogen ions for the calcium and magnesium ions of the hard water. The water treated with silica zeolites is alkaline, whereas that treated with the organic zeolites is acid. This discovery of hydrogen ion exchange would have been in itself of no practical value, as the resulting effluents would be too acidic for all ordinary purposes, but for the important fact that when these polyhydric phenol-formaldehyde resins are treated with a strong solution of common salt or any other sodium compound, they take up sodium ions giving resins which act exactly like siliceous zeolites in removing the hardness of water. When the hard water is percolated through the bed of such treated resins, the calcium and magnesium ions are deposited on the resin bed and the sodium ions are taken up giving soluble salts which pass into the water. The effluents from these waters are as alkaline as those from the silica zeolites. Periodically (*Please turn to page 82*)

Plastics Digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them. Requests for copies of the magazines mentioned should be directed to the individual publishers whose addresses will be mailed upon receipt of a self-addressed stamped envelope.

General

NEW STEP IN PLASTICS. Business Week *1939*, 43 (Nov. 18). *Catalin* process involves a method of coating tiny particles of phenolic resin with a viscose gel and thoroughly mixing the gel-coated resin with paper furnish up to 70 percent resin. Comparatively large pieces such as trays are pre-molded from the resin-pulp furnish by screening without danger of gumming up the equipment. Final molding under customary heat and pressure produces trays with improved strength as compared with those molded by the usual technic. Two new applications are now in the development stages. One is the molding of a big, one-piece refrigerator door liner; the other is the molding of an automobile trunk cover which, if successful, will introduce the possibility of further extension of its uses to automobile fenders and door panels.

MARKETING EFFORTS PUSH PLIOFILM SALES. Rubber Age *45*, 360 (Sept. 1939). In 1935 there were produced 1,428,000 yards of Pliofilm. It is predicted that in 1939 an annual volume of 25,500,000 yards in 40-inch width will be reached owing to the development of new uses for this 1 to 2.5 mils thick sheet material.

MAKE "SUGAR RUBBER." Business Week *1939*, 30 (June 10). Sugar is oxidized with nitric acid, mixed mechanically with turpentine, and then polymerized with hydrochloric acid. When the mixture thickens, the acids are neutralized with caustic soda, and the resultant rubberlike mass is washed and dried. The process is based on U. S. patent 2,150,068, taken out by Ernest Kleiber of Switzerland. Several experimental batches prepared in Louisiana are said to have yielded a product resembling natural rubber.

Materials and Manufacture

FUNDAMENTAL CHARACTERISTICS OF MOLDABLE PLASTICS. G. Brown. S. A. E. Journal *45*, 9–12 (Oct. 1939). Discussion of the properties of plastics with particular reference to impact strength and resistance to water.

DEVELOPMENTS IN BITUMEN PLASTICS. W. H. Cambden. Chem. and Ind. (London) *58*, 867–8 (Sept. 23, 1939). A chronological survey of the advances in bituminous moldings, mainly for electrical purposes, since 1900. By careful selection of ingredients and by curing treatments, the softening point of such moldings has been raised and fire-, arc-, oil- and weather-resistant types have been made available. Discussion Ibid. *58*, 250–1 (Mar. 18, 1939).

NEW PROCESSES FOR THE PREPARATION OF CELLULOSE DERIVATIVES. R. Steinmann. Kunststoffe *29*, 282–6 (Oct. 1939). A review of recent developments in the production of cellulose esters and ethers.

MIXED SYNTHETIC-RESIN-PROTEIN PLASTICS. A. Lefèvre. Rev. Gen. Mat. Plastiques *15*, 231–3 (Aug. 1939). The admixture of resins and proteins to promote mutual stabilization and improved properties as covered in various patents is surveyed.

Molding and Fabricating

JOINING METAL AND PLASTICS. J. E. Simonds. Product Eng. 10, 493–7 (Nov. 1939). Methods discussed include crimping, wrap-around, press-on, electroplating, and the Chilton inlay process. The use of the spring clip or speednut fastener as a means of securing plastic and metal parts is illustrated for several parts.

ELECTROFORMING. S. Wein. Product Eng. *10*, 486–8 (Nov. 1939). Production of molds by an electroplating process used by the Cerro de Pasco Copper Company is described.

MOLDS AND DIES BY ELECTRO-DEPOSITION. Automotive Ind. *81*, 315, 418–9 (Oct. 1, 1939). A description of the U. S. Rubber Company's Ekko process for preparing electrolytic shells of articles to be molded. This shell must be backed up or mounted on a metal base to be used in plastic molding. See *Plastics Digest*, page 48, in Sept. 1939, issue.

Applications

VIEWING TUBES FOR HIGH PRESSURE. J. R. Roebuck and E. E. Miller. Rev. Sci. Instrument *10*, 179–80 (June 1939). An oversize tube of transparent phenolic plastic is put into a slotted steel supporting tube by cooling in liquid air. Such a device has proved reliable at 400 atmospheres and calculation indicates that 1000 atmospheres is the upper limit of safety for tubes of this type. An important feature of these tubes is said to be that in operation no primary tensile stresses exist in the transparent material.

PLASTIC BEARINGS FOR MODERN MACHINERY. P. Grodzinski. Plastics *3*, 304–8 (Oct. 1939). A review of recommendations for bearing dimensions, pressure, lubrication, and operating conditions based on experimental and service observations in Germany.

PLASTICS ON 1940 CARS. M. A. Brown, Jr. Automotive Ind. *81*, 312–4, 404–9 (Oct. 1, 1939). A survey of the applications of plastics on 1940 automobiles and of the methods used for their fabrication.

USE OF PLASTICS IN THE MOTOR-CAR. L. J. B. Forbes. Trans. Inst. Plastics Ind. *8*, 61–73 (June 1939). The uses of plastics in automobiles can be divided into four categories. (1) Electrical parts which have been fully developed. (2) Engine parts in which there is possibility of future use of plastics in bearings, carburetters, air cleaners, induction pipes, and fans. (3) Safety glass wherein plastics play a major role. (4) Body construction in which the greatest prospects of development lie.

Testing

DETERMINATION OF NUMBER OF LAYERS IN LAMINATES. W. Paul. Kunststoffe *29*, 278–82 (Oct. 1939). Aminoplastic laminates can be deresinified with 30 percent hydrogen peroxide. Phenolic laminates can be similarly decomposed by a boiling mixture of 1 part of concentrated nitric acid and 5 parts of acetone. The fillers can be identified by well-known methods.

Coatings

MODERN COATINGS. Chemical Industries *45*, 391–6 (Oct. 1939). A veritable chemical revolution has taken place in the coatings field. The older paints and varnishes were all natural raw materials compounded by the strictly mechanical methods of grinding, dissolving, and mixing. Twenty years ago the cellulose lacquers first appeared. A decade ago the earliest of the synthetic resin lacquers came on the market. This paper classifies protective films for discussion as follows: oxidizing oil films (ordinary paints), oil-soluble varnishes (resin-drying oil combinations), spirit-soluble varnishes (shellac), cellulose lacquers, synthetic resin lacquers (including modified resins), cold water paints (casein), metallic base paints, coatings based on rubber derivative and rubberlike compounds and miscellaneous coatings (ethyl silicate, etc.).

PAINT FOR DURABILITY ON CONCRETE SURFACES. P. O. Blackmore. Am. Concrete Inst. Jour. *10*, 545–51 (June 1939). Two primers were outstanding in performance, namely, a long-oil, gray-pigmented primer and a phenolic-resin, china-wood-oil varnish with aluminum bronze pigment.

REVIEW OF FINISHING METHODS. G. Klinkenstein. Metal Ind. *37*, 370–4 (Aug. 1939). This discussion includes brushing, roller coating, tumbling, centrifuging, hand dipping, machine dipping, gasket coating, manual spraying and automatic spraying.

PLASTICS AS LACQUER RAW MATERIALS. O. Jordan. Kunststoffe *29*, 254–6 (Sept. 1939). Among the resinous products covered in this review are the alkyds, air-drying phenolics, urea-formaldehyde resins, chlorinated rubber and vinyl resins. It is estimated that this single largest outlet for plastics takes 30 percent of the synthetic resins produced in the United States and 40 percent of the output in Germany.

TENITE gains on 1940 cars

PACKARD. Three large panels of Tenite practically cover the Packard instrument board. They are compression molded in a distinctive brown and ivory variegation to harmonize with the upholstery and other interior fittings. Molded by the Sheller Manufacturing Company.

CHRYSLER. Seven panels of translucent ivory Tenite add richness and beauty to the Chrysler instrument board. The glove compartment door, which is the largest panel, is injection molded over a metal stamping. All of these parts are molded by Chrysler Corporation.

NASH. The two panels forming the frame for the Nash instrument dials and clock are injection molded of clear transparent Tenite. They are flocked on the back with a bluish-gray color to give the effect of fabric under glass. Molded by Cardinal Corporation.

TENITE is the most widely used plastic for motor car interior appointments, and 1940 cars display more Tenite than any previous models. Similar increases in Tenite applications may be noted in many other large industries. An illustrated book on the uses of Tenite will be sent on request.

TENITE

An Eastman Plastic

TENNESSEE EASTMAN CORPORATION, KINGSPORT, TENN. *Subsidiary of the Eastman Kodak Company*

U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

POLYAMIDE RESINS. W. R. Peterson (to E. I. du Pont de Nemours and Co.). U. S. 2,174,527, Oct. 3. Fiber-forming polyamide resins which are viscosity-stable are made by forming a polyamide in presence of a stabilizer, e.g., an amine or a carboxylic acid, which is capable of forming an amide.

UREA RESIN. Leonard Smidth. U. S. 2,174,535, Oct. 3. Effecting a urea-formaldehyde condensation reaction under conditions which do not permit formation of a clear solution, evaporating off the water under mild conditions to prevent continuance of the reaction; and using the product in molding or casting compositions.

POLYSTYRENE COATING. S. M. Stoessel and A. R. Gabel (to Dow Chemical Co.). U. S. 2,174,538, Oct. 3. Plasticizing polystyrene resins with a salicylate of a glycol monoether or monoester; and using the product in coatings.

STABILIZING VINYL RESINS. C. H. Alexander (to B. F. Goodrich Co.). U. S. 2,174,545, Oct. 3. Stabilizing plasticized vinyl chloride resins by adding waterglass and milling on a hot mill till the water is all evaporated.

PHOTOPRINTING. Anton F. Greiner. U. S. 2,174,629, Oct. 3. A sensitized coating for photoprinting comprises polyvinyl alcohol and a catalyst for insolubilizing the polyvinyl alcohol when exposed to light.

RUBBER HYDROCHLORIDE. H. A. Winkelmann (to Marbon Corp.). U. S. 2,174,673-4, Oct. 3. Dispersing rubber hydrochloride in organic solvents, e.g., benzene, by fluxing rubber with a resin, calendering in thin sheets and converting the rubber to the hydrochloride; and plasticizing rubber hydrochloride with phthalyl glycollates or glycol phthalates for use in molding compositions.

ABRASIVE SHAPES. E. E. Novotny (to Durite Plastics, Inc.). U. S. 2,174,755, Oct. 3. Making a wet mix from abrasive grains, a resinous coating liquid and a powdered potentially active resin capable of reacting with the coating liquid to form a dry mix which can be molded.

OIL-SOLUBLE RESIN. Wm. H. Butler (to Bakelite Corp.). U. S. 2,174,819, Oct. 3. Solubilizing phenol-formaldehyde resins in vegetable oils by heating above 347 deg. F. in an inert gas.

ADHESIVE. E. L. Kallander (to Dennison Mfg. Co.). U. S. 2,174,885, Oct. 3. A heat-responsive adhesive is made of shellac and a vinyl resin, blended with another resin to bring the softening point to approximately 134 deg. F.

PLASTIC CEMENT. E. F. Kiefer (to National Carbon Co.). U. S. 2,174,886-7, Oct. 3. Use of a resinified furan derivative as binder in making baked molded carbon articles.

ABRASIVE DISKS. H. R. Stratford (to Stratmore Co.). U. S. 2,174,902, Oct. 3. An abrasive disk, with phenol-formaldehyde resin binder, has its outer edge thicker than its center.

INSULATING VARNISH. R. H. Thielking (to Schenectady Varnish Co.). U. S. 2,174,912, Oct. 3. Coating copper wire with a smooth, flexible film of vinyl chloride : vinyl acetate interpolymer.

POLYVINYL CHLORIDE. C. H. Alexander (to B. F. Goodrich Co.). U. S. 2,175,048-9, Oct. 3. Plasticizing vinyl chloride resins with thianthrenes or their substitution products, with or without litharge.

CONTAINERS. E. T. Ferngren; E. T. Ferngren and Wm. H. Kopitke (to Plax Corp.). U. S. 2,175,053 and 2,175,054, Oct. 3. Improved mechanical means and apparatus for molding a thermoplastic into tubular containers with closed ends.

WALL COVERING. H. Strauch (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,175,096, Oct. 3. Use of a soft alkyd resin, modified with drying oil acids, in aqueous emulsion floor or wall covering compositions.

FORMING FILMS. E. L. Mack and E. H. Morse (to Reynolds Research Corp.). U. S. 2,175,125, Oct. 3. Extruding plastic film-forming material onto a base while moving the orifice farther from the base so that the film is stretched before making contact with the base.

AIRPLANE PROPELLER. Victor Lougheed. U. S. 2,175,204, Oct. 10. A molded propeller blade has a plastic core surrounded by a porous blade former, through the pores of which the core is bonded to a reinforced plastic shell.

OIL-SOLUBLE RESIN. Israel Rosenblum. U. S. 2,175,215, Oct. 10. Condensing a mixture of phenol and amylphenol with formaldehyde and a monoglyceride of a drying oil acid to form a varnish resin.

THERMOPLASTIC. R. V. Townend and W. R. Clayton (to Wm. Zinsser and Co.). U. S. 2,175,232, Oct. 10. A molding composition comprising shellac, zinc oxide and an oxide of calcium, magnesium or lead.

TUBING. F. H. Reichel and A. E. Craver (to Sylvania Industrial Corp.). U. S. 2,175,313, Oct. 10. Forming tubing by extruding nitrocellulose (containing 6–11% moisture) through an orifice into an aqueous coagulating bath.

PHENOLIC RESIN. W. Hentrich and F. Schlegel (to Henkel und Cie.). U. S. 2,175,393, Oct. 10. Condensing a phenol with formaldehyde in presence of an olefin and a catalyst, namely, perchloric acid.

UREA RESIN. O. R. Ludwig (to Resinous Products and Chemical Co.). U. S. 2,175,475, Oct. 10. Making stable aqueous solutions of intermediate urea-formaldehyde resins by effecting the resin condensation in presence of calcium chloride.

ELECTRIC FITTINGS. T. R. Scott and L. A. C. Pooley (to International Standard Electric Corp.). U. S. 2,175,672, Oct. 10. Sealing the metal and ceramic parts of an electric fitting together with the aid of polystyrene cements.

TRANSPARENT RESIN. L. Cserny (to Resinous Products and Chemical Co.). U. S. 2,175,793, Oct. 10. Making clear transparent phenol-formaldehyde resins by effecting the resin condensation in alkaline medium, acidifying with lactic acid and blending with a urea resin.

HIGH POLYMERS. Adolf Kämpfer. U. S. 2,175,961, Oct. 10. An improved extrusion press for making foils or plates from elastic highly polymerized products.

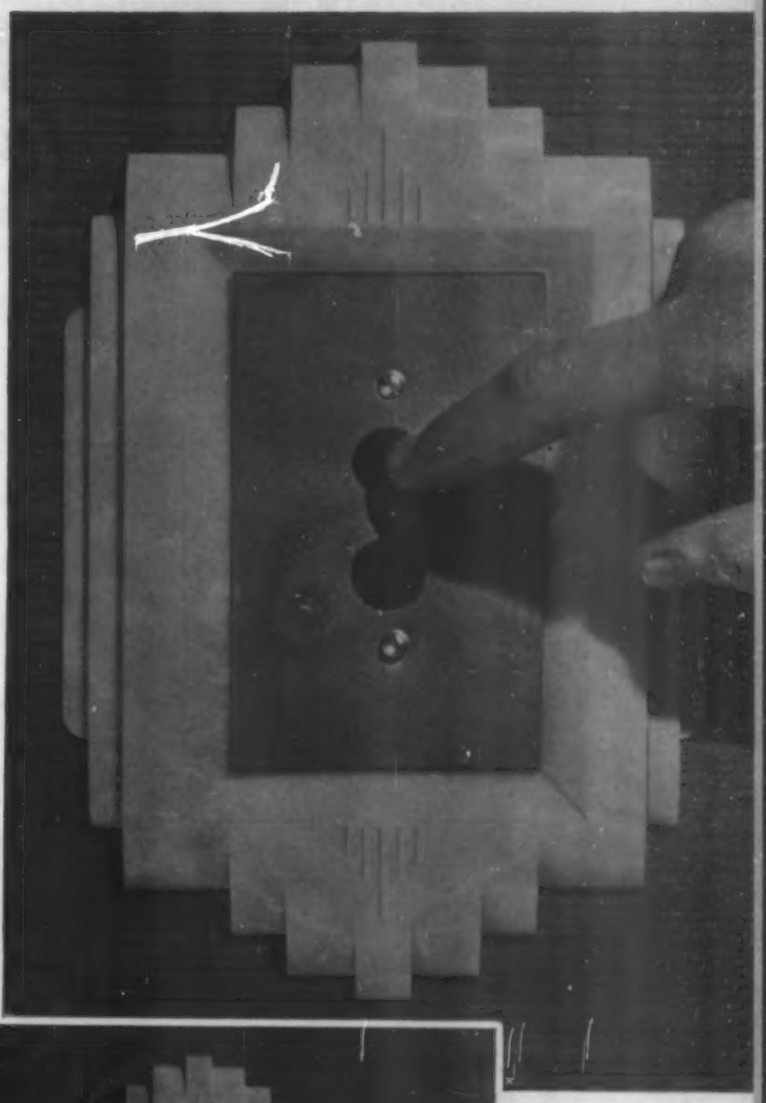
VINYLIDENE RESIN. R. S. McClurg and D. L. Gibb (to Dow Chemical Co.). U. S. 2,176,091, Oct. 17. Cold-rolling sheets of vinylidene chloride resin to improve the tensile strength and flexing resistance.

A Little Light on the Subject

. . . . OF NIXON ACETATE MOLDING POWDER INJECTION MOLDED BY GITS MOLDING CORPORATION

PROTECTO-SHIELD

Nixon Acetate Molding Powder **"clicks" again as a finished molded plastic—this time as "Protecto-Shields" created by the Gits Molding Corporation of Chicago. These beautiful, delicately mottled acetate shields will protect Mrs. America's walls from grubby fingers reaching for electric switches. A damp cloth will remove marks from the plaque—and save Mr. Landlord from repainting so often!**

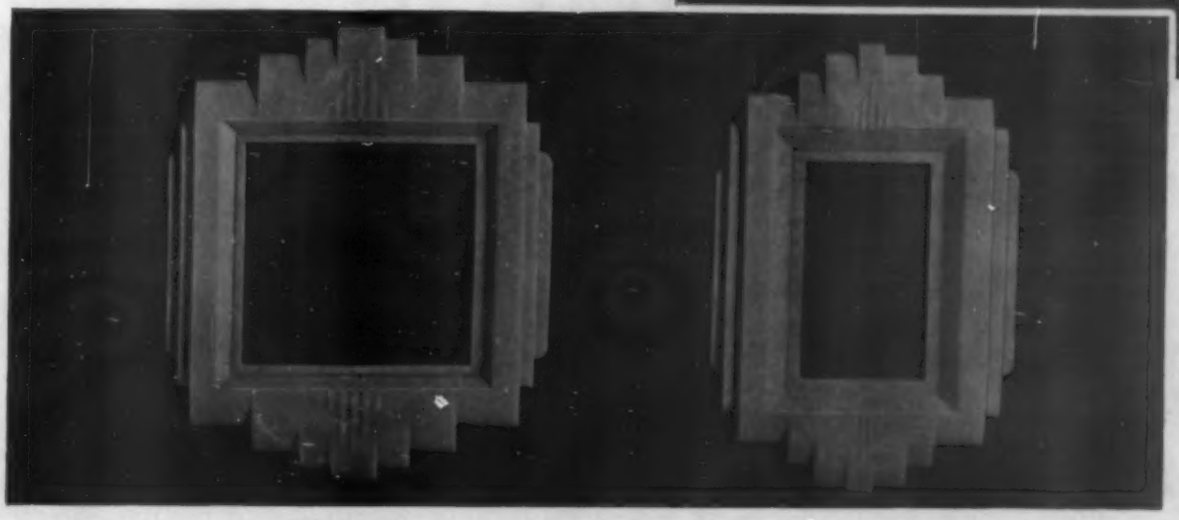


NIXON PLASTICS COME IN THESE USEFUL FORMS:

1 Nixon Acetate Molding Powder specially compounded for injection and compression molding. Wide variety of colors, tones and mottles.

2 Nixonite (Acetate) in opaque and translucent sheets, rods and tubes of all colors and types.

3 Nixonoid (Nitrate) in a full range of colors, mottles and patterns in sheets, rods and tubes.



NIXON NITRATION WORKS

NIXON NEW JERSEY

Equipment

A NEW FASTENING DEVICE, CALLED A SPEED CLIP, HAS recently been developed by the Tinnerman Speed Nut Co., to fasten plastic parts to metal without the need of gaining access to the opposite side of the assembly. In many cases it also avoids the need of threaded inserts. The device itself is a tubular-like formation of spring steel as shown in Fig. 1. While being quite cylindrical in shape, it is not a complete cylinder. Other details are shown in the assembly action illustrations below.

Figure 2 shows how the end of the speed clip which enters the hole, is curled-in, while the other end is flanged outward. It also shows that in this entering position, the tongues on either side are compressed into the body of the clip.

Figure 3 shows how, with clip fully inserted, the two cam-like tongues spring out and lock the clip firmly in the hole. It also shows how the flanged end prevents the clip from completely passing through the hole. However, the clip is not yet fully expanded, as the end of the stud in Fig. 3 has just approached the further end of the clip. But, in Fig. 4, when the stud is pushed completely *home*, the clip is fully expanded and the curled-in end of the clip bites into the stud to lock it securely. This assembly method is said to be adaptable to most any part such as name plates, trim strips, medallions and the like. There is, therefore, what may be termed a double locking device. It is an assembly device which first locks itself firmly in place and also firmly locks the stud of the name plate in assembled position.

With slight variations in design, as in Fig. 5, this clip may be used as a permanent lock, a removable lock or as a slideable grip type. The permaneht locking type is best suited to assemblies that must endure much vibration and where removal is seldom necessary. The second, or removable locking type, is best adaptable to assemblies that may require an occasional separation of the parts. By pre-determining the amount of "pull" desired for removal, the curled-in end of the clip is formed with the correct degree of *bite*. The slideable grip type is recommended by the manufacturer where studs are made of relatively soft plastic materials such as cellulose acetates.

This speed clip assembly device is unique in that it eliminates the use of wrenches, pliers or screw drivers in assembling. The entire assembly work is reduced to the simple and rapid insertion of these clips into holes and the studs into the clips.

TO MEET THE DEMAND FOR A SMALLER PRESS OF THE QUICK-acting toggle-type developed by The Standard Machinery Co., this manufacturer has added to its line two new 20-ton models. These presses are similar in capacity, stroke, openings between platens, etc. One is a self-contained, hydraulically operated unit with motor and duplex pump in the base. The other is designed for air operation, at 125 lbs. pressure, and furnished without motor or pump, ready to connect to pressure supply.

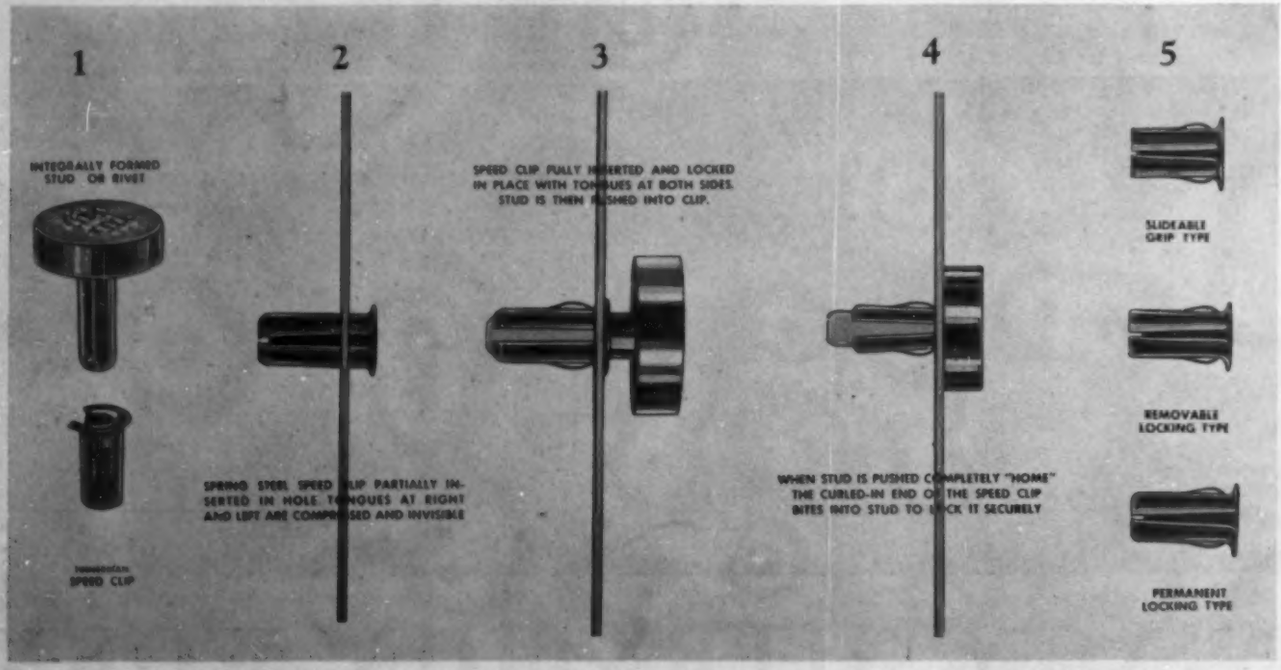
THE MAIN BODY OF THE PRESSURE GAGE OF CONNELLY Iron Sponge & Governor, is made of semi-steel, contains 2 black etched-aluminum scales, one on each side of the gage's transparent plastic tube. One scale reads from 0 to $3^1/_2$ lbs., the other from 0 to 56 oz. Thumb screw at top, closes the tube opening to prevent loss of mercury when gage is placed in horizontal position as illustrated above, instead of normal vertical position. At the bottom is a shut-off cock.

CUMBERLAND ENGINEERING CO. HAVE RECENTLY INTRO-duced a line of grinding and granulating machines to the market, said to be entirely new in type and principle of operation. Smaller machines employ the one-piece cutter ring; larger machines use the inserted knife type cutter ring. Knives are ground at a less acute cutting angle which protects them against chipping or too rapid dulling. All knives are adjustable and readily accessible for cleaning. The machines operate with a wide range of screen sizes and are able to produce the finer particle sizes, uniformly cut, it is claimed.

A SMALL COMPACT RATE OF FLOW INDICATOR MADE BY Morey & Jones, Ltd., is of the differential pressure type that does not use mercury as the basic element determining its calibration. It is reported especially suitable for such purposes as: indicating the flow of liquids, steam and gases in all process industries; for balancing flows in refineries and absorption plants; for indicating rate of flow of cooling water and lubricating oil to bearings in prime-movers, cooling water to condensers and electrical transformers, and water to filters and softeners, as well as for indicating liquid levels in boilers and tanks, whether under pressure or not.

(*Please turn to next page*)

Operation of New Speed Clips


1
2
3
4
5
INTEGRALLY FORMED STUD OR RIVET
SPEED CLIP
SPRING STEEL SPEED CLIP PARTIALLY INSERTED IN HOLE TONGUES AT RIGHT AND LEFT ARE COMPRESSED AND INVISIBLE
SPEED CLIP FULLY INSERTED AND LOCKED IN PLACE WITH TONGUES AT BOTH SIDES. STUD IS THEN PUSHED INTO CLIP.
WHEN STUD IS PUSHED COMPLETELY "HOME" THE CURLED-IN END OF THE SPEED CLIP BITES INTO STUD TO LOCK IT SECURELY
SLIDEABLE GRIP TYPE
REMOVABLE LOCKING TYPE
PERMANENT LOCKING TYPE

An interesting new product, molded and assembled by Universal: combination pen set, desk thermometer and paper weight, for Zephyr-American Corp.

U.P. Service
for quality

- **MOLDING**
- **DESIGN**
- **MOLD MAKING**
- **ASSEMBLY**

of *ALL* PLASTIC MATERIALS

With rising costs of all metals you should certainly consider plastics.

Plastics offer: Strength—Color—Resistance to Weather—High Dielectric—Decorative Value.

For your product, Universal is at your service.

UNIVERSAL
PLASTICS CORPORATION
Molded Products of Plastic Materials

Factory: 235 Jersey Ave.
New Brunswick, N. J.

New York Office:
500 Fifth Ave.

The most modern molding press will be inefficient

UNLESS . . .

A COLTON PREFORMING
machine backs it up!

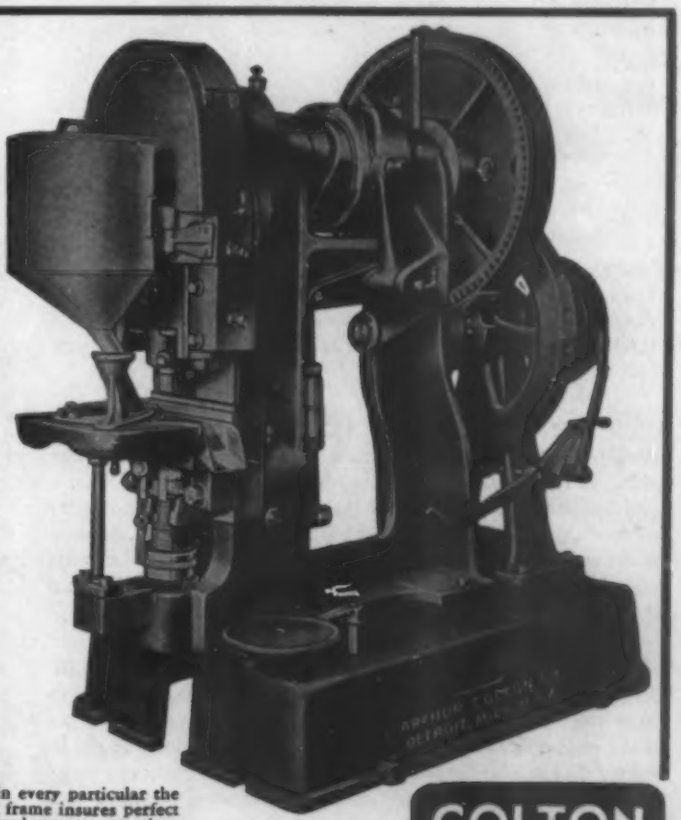
Bakelite Preforming Machine at the World's Fair

In the Ford Motor Company building at the World's Fair, you will be able to see in operation a Colton No. 5 1/2 Preforming Press, making slugs of phenolic resin for the manufacture of parts for Ford Motor cars.

In their plants, the Ford industries employ many Colton Presses for the compression of preforms of phenolic resin and similar materials. Also our Presses are used for the compression of metal powders. This requires not only great strength, but precision as to weights and measurements, and the constant use of these machines demand stamina which make them dependable and economical.

Other motor car manufacturers, including General Motors and Chrysler, as well as many other industries such as General Electric, National Carbon, Colt Patent Fire Arms, Otis Elevator, Moraine Products (they have twenty-four machines), use this same type and size machine in their plants for similar work.

When visiting the Fair see this machine running, notice its smooth, silent operation, without strain or laboring. Possibly you need such a machine in your plant. Let us tell you more about it.



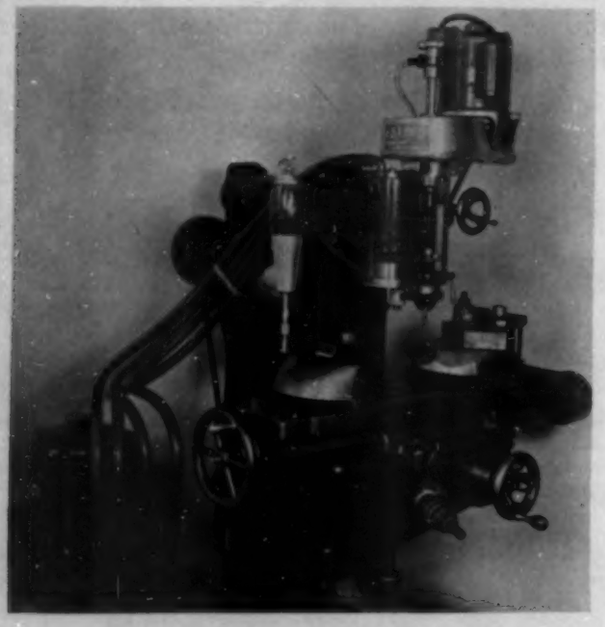
ARTHUR COLTON CO.
2604 E. JEFFERSON AVENUE
DETROIT, MICHIGAN

The new improved 5½ tablet machine—in every particular the finest the market has to offer. Solid steel frame insures perfect operation; improved die fasteners, improved cam construction, heavier ejecting mechanism, vanadium steel plungers—make high speeds possible without fear of breakdown or lowered quality. Makes tablets up to 3" in dia. having a fill depth up to 2½".

COLTON
DETROIT

INCORPORATING AN ENTIRELY NEW PRINCIPLE IN ALTERnating current adjustable speed motors, the new Ajusto-Speed motor has many new advantages and economics according to a release from the manufacturer, the Louis Allis Co. This motor is a combination of an eddy current clutch and a standard constant speed AC squirrel cage motor. Special features reported are: an unusually wide range of speed variation from zero to full speed at full load torque; continual operation at low speed without overheating; rapid intermittent starting and disconnecting of load.

PRESSURE KING, FOUR-CYLINDER, PISTON TYPE PORTABLE air compressor, manufactured by Empire Compressor Mfg. Co., is said to maintain a steady even flow, with no pulsations, at any desired working pressure. The complete outfit includes a spray gun of the internal mix, bleeder-type with internal atomization. It may be used for industrial painting, maintenance work, tree spraying, tire inflation, insecticides, chemical spraying, wing dope spraying, sizing oil, etc.



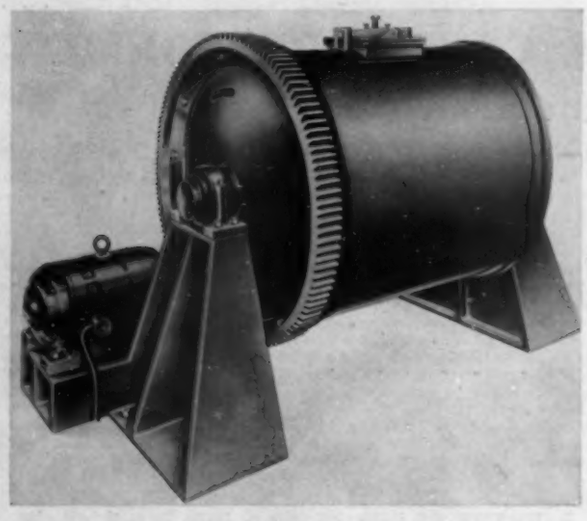
EKLIND HYDRA-SPEED DUPLICATING UNITS, DISTRIBUTED by Universal High Speed Tool Co., are said to be adapted to any machine tool by using a suitable adapting bracket. Designed for the average range of small and large die shops making plastic, rubber and drop forge molds and dies, they duplicate direct from a plaster, wood model or template. Units, such as the one illustrated above, are provided with standard equipment.

LYON IRON WORKS HAVE DESIGNED A HYDRAULIC DIE handling truck based on the cantilever type with hydraulic elevating table. It is furnished with a die separating and turning device, a special adjustable clamp for holding various size dies and a two-speed hydraulic pump. A winch for pulling dies on and off the table, mounted on the under side, is operated by a removable hand crank and elevates with the table. Truck is of the castered steer type, equipped with a brake, rubber tires and can be furnished in various specifications.

PRECISION SET VARIABLE SPEED TIMER INTRODUCED BY the Taylor Instrument Cos. for use on molding presses, is claimed to make possible the exact overall timing of the cure, the exact sequence of the various steps and functions of the cure, and permit the adjustment of the work load so that the individual operator works to greatest efficiency. Seven standard gear ratios provide seven ranges of time adjustment, for each of which there are 80 different speeds of cam revolution. Closed mercury switches are used to eliminate open contacts, and are connected to solenoid air pilot valves of the lock-in type which will not change position in case of electrical failure during a cure.

SAFETEST, A POCKET-SIZE TESTER AND POLARITY INDICAtor for electrical and radio circuits from 80 to 550 volts, AC or DC, has been put on the market by M. M. Fleron & Son, Inc. The assembly has at one end a Neon indicator bulb fully enclosed and protected by a transparent Bakelite polystyrene housing molded by Boonton Molding Co. A resistor protects the lamp against higher voltages. At the opposite end is a pair of insulated test lead tips. A pocket clip makes it convenient to carry. The device (illustrated above) may be used for testing motors, fuses, spark plugs, etc., and is said to make obsolete the pigtail socket and lamp method of finding open or dead circuits.

THE MANUFACTURER OF *OILITS*, SEMI-AUTOMATIC LUBRIcators have adopted Lucite methyl methacrylate, a product of E. I. du Pont de Nemours & Co., for the oil container. These lubricators are made in single pin and twin pin types by the National Industrial Products Corp. Intended principally for the lubrication of sleeve bearings, the unit, with minor changes in design, may also be used on fixed mountings where vibration is excessive. Its application to sleeve mountings should be where installation is accomplished by inserting the lubricator body in a pipe nipple which is screwed into the bearing housing. Greater visibility, ease in refilling and cleaning, and resistance to moderate heat and damage from oil are said to result from the use of the plastic, which is lightweight and practically unbreakable.



THE H. K. PORTER CO., INC., KNOWN FOR MORE THAN 70 years as manufacturers of industrial and switching locomotives, recently has expanded its activities by the establishment of a separate division for the design and manufacture of many types of processing equipment, including ball and pebble mills, tube mills, agitators, mixers, blenders, autoclaves, kettles, tanks, etc. Several of these products are reported to incorporate new features of design and construction developed by the company's process equipment engineering department. A typical ball mill is pictured above.

Selected dyestuffs and organic pigments for the coloring of plastics

GDC

GENERAL DYESTUFF CORPORATION

435 HUDSON STREET, NEW YORK, N. Y.

Boston, Mass. Philadelphia, Pa. Providence, R. I.
Chicago, Ill. Charlotte, N. C. San Francisco, Cal.

THE SECRET *for healthy* GROWTH

PRESENTING baby's diet so temptingly that even his miniature appetite quickens—keeping every morsel palatably warm—Baby's Dyner, a new item of Lockwood Products, molded by Auburn, contributes its bit toward the healthful growth of today's babies.

Just as new and improved methods of feeding contribute to baby's health and happiness—molded plastics, from the forms of an experienced molder, will contribute to the healthful growth of an infant product—or give an old product a new lease on life.

That is why so many manufacturers, seeking that experience, bring their molded plastic problems to Auburn, where 60 years of pioneering work plus unusual care and the highest skill in molding and mold-making stand back of every job.

ESTABLISHED 1876

MOLDED PLASTICS DIVISION OF
AUBURN BUTTON WORKS, Inc.
AUBURN, N. Y.

Publications

Write for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices.

Patent Fundamentals

by Adelbert Schapp

Published by The Industrial Press, 148 Lafayette St., New York
Price $2.00 **176 pages**

This is a textbook for inventors, executives, and students which explains in non-technical language and demonstrates by practical examples the underlying principles of true invention, procedure in obtaining patent protection, drafting effective claims, making assignments, issuing licenses, and, in brief, how to protect both invention and inventor. Practical examples are given and court decisions discussed.

This treatise includes information on trademarks and copyrights, design patents, prints and labels, and illustrates the different conditions under which these protective measures become available. It is written in textbook style, and is adapted for use in educational institutions having courses dealing with the fundamentals of patent law.

Patents and The Public Interest

by H. A. Toulmin, Jr.

Published by Harper and Bros., 49 E. 33 St., New York, 1939
Price $2.50 **205 pages**

The patent system is discussed in this book in such plain language that it is hard to believe a patent attorney wrote it. The author considers in Part I the constitutional and economic background of the system and in Part II the problems of monopolies, pools, licensing, displacement of labor, and suppression of patents. In Part III he outlines the proposals for reform and states in no uncertain terms his personal reactions to each of them. In this connection it is of interest to note that five bills passed by Congress and signed by the President put into effect most of the reforms advocated by the Monopoly Committee. The creation of a special Patent Court and the limitation of the life of a patent to 20 years from the date of filing an application are still pending. Part IV is sort of an anti-climax to the three preceding sections and is a review of modern inventions in many industries from plastics to foods and from the home to the farm.

The author's presentation of the case is very stimulating, although one cannot always agree with his bare statements. Thus, the daily findings of the Federal Trade Commission seem to belie the fact that "We have established new standards of morals in merchandising by truth in advertising" (page 4). We question also whether it was the willingness "to work for the reward of the patent" (page 14) that spurred on Bell, Goodyear, and others of their stature, or whether it was the same sort of inner urge that leads a wealthy lawyer to sit down and write books and articles that can't begin to bring him in nearly as much revenue as his law pursuits. Following to its logical conclusion his reasoning that the "first-string" technical experts are already hired by the leading interests leaving the Government only second-string men (page 103) would lead us to the position that the "first-string" attorneys are all working for private corporations leaving only the second-string variety for judges.

The author apparently feels very strongly that the ruling of the court that the pencil of Faber with a rubber on one end was not "invention, but aggregation, because you could not use the pencil and rubber at the same time" did not "encourage the progress of science and the useful arts." This reviewer believes, however, that the flood of patents now issued weekly in this country is a delight primarily only to the fraternity of patent lawyers, and that the progress of industry and science would be benefited by a stricter interpretation of what constitutes invention. For example, it is readily apparent that every organic plastic could inherently be used for making dentures (although admittedly some will be more suitable for that purpose than others) or that any fiber made from a synthetic resin could be used in the manufacture of a parachute. Yet with each patent for a new synthetic resin comes a host of patents covering its use for dentures, parachutes, can linings, etc. It seems to be necessary for every inventor of a new plastic to file for patents on the infinite variety of uses to which his resin can be put in order to protect himself from the embarrassing position of being unable to use his brain child because parasites have taken out patents on all its potential applications. This type of patent is certainly not to the public interest. Nor does it contribute to the security or peace of mind of the corporate owner or inventor of a new material who must constantly fear that some such legal loophole will deprive him of full benefits of use of his material for its logical applications.

As aforementioned, the author has contributed a very stimulating and thought-provoking book on the patent system. G. M. K.

Industrial Market Data Handbook of the United States

by O. C. Holleran

Published by U. S. Government Printing office

(Domestic Commerce Series No. 107) Available from Supt. of Documents, Washington, D. C., or Bureau of Foreign and Domestic Commerce and District Offices

Price $2.50 (buckram) **907 pages**

A new guidebook for American business men, this handbook, the first of its kind ever published contains vital information for establishing new sales territories, production quotas and marketing campaigns. Prepared as a cooperative study by the Marketing Research Division of the Bureau of Foreign and Domestic Commerce, the Census Bureau and the Bureau of Mines, the data include complete figures on industrial production, employment, value of products, cost of material, fuel and power, and output per wage earner for each of the 3,070 counties in the United States, and similar data for every city or more of 10,000 population. The figures in the handbook pertain to 1935, the latest year in which information in this form is available. The wide scope, clarity and accuracy of this extensive study make it an invaluable source of important information for industrial marketing executives, financial organizations, economists and others interested in the progress of heavy industry. H. B. J.

Chemical Engineering Catalog—24th Edition

Reinhold Publishing Corp., 330 W. 42 St., New York, 1939
Price $3.00 **1026 pages**

This well-known volume continues to serve as a convenient source of information regarding plant and laboratory equipment, chemicals and raw materials, and technical books. Sixteen pages of nomographs and charts selected on the basis of informative value and comparative unavailability elsewhere are included as a new feature. Copies may be obtained without cost by those engaged in the chemical and allied industries upon assurance that the book will be returned upon publication of the 1940 edition. To others the price is $3.00. G. M. K.

WHERE TODAY'S PROJECTS ARE TOMORROW'S PRODUCTS IS the title of an illustrated two-color booklet recently issued by Inland Mfg. Div., General Motors Corp., manufacturer of rubber, metal and plastic products. Photographs of the company's two large plants at Dayton, Ohio, and Clark, N. J., are included along with pictures of manufacturing operations and finished articles.

ORGANIC ACIDS AND ANHYDRIDES, ONE OF A SERIES OF NEW pamphlets designed to present information on industrial organic chemical families, has recently been issued by Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York, N. Y. It describes a number of the new, commercially available organic acids and anhydrides containing 4 to 8 carbon atoms, and gives physical properties in a convenient table.

THE SOUTH BEND LATHE WORKS, SOUTH BEND, INDIANA, has issued a new catalog which is said to be the most complete lathe catalog ever published. This catalog contains 112 pages with over 250

Follow the Line of Least Sales Resistance

A bullet-like bed lamp shell molded by Stokes for Eagle Electric Co.

Attractive clock case designed and molded by Stokes for the Sessions Clock Co.

Smart product styling is your best means of eliminating sales resistance. If that problem has you worried—

CONSULT STOKES DESIGN-ENGINEERS

well-known for planning and developing molded pieces that *sell* with a minimum of effort and sales expense. Don't feel obligated by inquiring about the service we offer. We'd like to work with you.

JOSEPH STOKES RUBBER CO.

Gen'l Offices: 322 WEBSTER ST., TRENTON, N. J. . . . . Plants: TRENTON, N. J. and WELLAND, ONT.

MOLDERS OF ALL PLASTICS—Including Hard Rubber—SINCE 1897

ALL FACILITIES WAITING FOR YOU

• Located in a fine little Maine village 50 miles from Portland, this plant offers many advantages to the manufacturer who is moving, expanding or decentralizing. The buildings are in excellent condition with ample space for manufacturing and storage. Friendly, intelligent labor, water for processing and electrical energy, are among the many assets which go to make this property unusually attractive. Fast transportation facilities to Boston, New York and all principal eastern markets. Maine has no State income tax, no sales tax, no machinery tax, no corporation tax. There are a few other plants ready for occupancy and many business sites available. State requirements of your business. Address: Maine Development Commission, Room 470, State House, Augusta, Maine.

MAINE INDUSTRY

MAINE DEVELOPMENT COMMISSION

illustrations and shows 75 different sizes and types of South Bend back-geared screw cutting lathes for production manufacturing, tool room and general shop work. New items shown for the first time in this catalog include a 1 in. collet capacity precision bench lathe mounted on a welded steel bench, and a complete line 14½ in. swing lathes.

DECORATORS, ARCHITECTS AND DESIGNERS WILL BE INTERested to see a new booklet called *Formica, A Modern Plastic*, because it is filled with photographs of recent installations of this material in stores, homes, offices, kitchens and baths. Color plates illustrate the variety of colors available in plain, mottled and veneer surfaces. Issued by Formica Insulation Co., Cincinnati, Ohio.

ADDITIONAL DATA ON HERCULES CHORINATED RUBBER IS incorporated in the new loose-leaf handbook recently issued by Hercules Powder Co., Inc., Wilmington, Del. Information on the properties, solubility, plasticizers of the material and its application for protective coatings and finishes, adhesives, emulsions, and a concentration-viscosity graph are included in the technical data.

THE NEW 1940 CATALOG AND DATA BOOK ON SPRAY PAINTing and finishing equipment is now available upon request to the Binks Manufacturing Co., 3114–40 Carroll Ave., Chicago, Ill. Consisting of 104 factual and highly illustrated pages, the catalog is organized for ready reference purposes. It gives the answers to everyday finishing problems, reports new developments in spray painting equipment, gives prices, and provides engineering and performance data on all types of spray guns, spray booths, air compressors, painting outfits, extractors, respirators and hose.

THE STORY OF AUTOMATIC MOLDING, ITS ADVANTAGES, descriptions of intricate moldings with threads, side-draws and undercuts, are included in a new Stokes Automatic Molding Machine catalog recently issued by F. J. Stokes Machine Co., Philadelphia, Pa. Several models are illustrated including variations of these machines equipped for thermo-setting materials. Case histories of savings, conversion tables and other valuable information should be especially interesting to molders, engineers, etc.

BULLETIN NO. 97, COVERING SPOUT TYPE MAGNETIC SEPArators has been issued by the Stearns Magnetic Mfg. Co., Milwaukee, Wis., maker of an extensive line of magnetic separators and magnetic power transmission devices, including magnetic clutches, brakes and magnetic clutch-brake combinations.

THE 1939 CATALOG AND DATA BOOK OF ELASTIC STOP NUT Corp., 1013 Newark Avenue, Elizabeth, N. J., explains graphically the Elastic Stop principle, whereby the nut is locked to the bolt through the action of a resilient non-metallic collar which eliminates all thread play between nut and bolt.

Contained also in this 56-page book are comparative test data, suggestions as to where Elastic Stop Nuts can be used to advantage, numerous illustrations of applications in various industries, and a complete listing of the standard nuts available.

ILLUSTRATIONS AND LISTS OF STANDARD SIZES OF VARIOUS types of ball and roller bearings manufactured by the company are contained in a catalog from Gwilliam Co., 360 Furman St., Brooklyn, N. Y.

Engineering Materials

by Alfred H. White

McGraw-Hill Book Co., Inc., 330 W. 42 St., New York, 1939
Price $4.50 **547 pages, 200 illustrations**

This book is intended primarily as a text for engineering students who have had an introductory course in chemistry, but it will also be of interest to practicing engineers who wish to become acquainted with recent advances in the field of materials. The subjects discussed include the ferrous and nonferrous metals and alloys, clay, silicates, lime, gypsum, fuels, soaps, organic preservatives, protective coatings, and plastics. The material is presented in a very readable style and the format and typography are excellent. G. M. K.

Step Out and Sell!

by William E. Holler,

General Sales Mgr., Chevrolet Div., General Motors Sales Corp.
Published by The Dartnell Corp., 4660 Ravenswood Ave., Chicago
Price $1.50, 6 x 9 inches **96 pages**

Unlike so many books on salesmanship published in late years, "Step Out and Sell" is written for successful salesmen by a successful salesman. It is not one of those "Don't do as I do, but do as I tell you" textbooks. Mr. Holler is admitted to be one of the greatest salesmen of his time, evidenced by the fact that within the last ten years more than four billion dollars worth of automobiles have been sold through the use of the very same principles and methods he presents in this book.

The book is full of interesting stories about selling. There is not a dry page in it. It includes many of the stories which Mr. Holler has told at sales meetings and conventions, and which have made these meetings the talk of the industry. It is human and inspiring to a remarkable degree.

Leather Finishes

by J. S. Mudd

Chemical Publishing Co., Inc., 148 Lafayette St. New York, 1939
Price $4.25 **116 pages**

The formulation, manufacture, and application of leather coatings are discussed from the practitioner's viewpoint. The author notes that "Water finishes are generally more economical, give a more natural feel, and are used on the majority of light leathers, but for moroccos and certain kinds of upholstery leathers, cellulose finishes are undoubtedly superior on account of better water resistance." The raw materials employed in both types of finishes are listed and described. No mention is made of the synthetic resinous products which are utilized to some extent in this country for leather finishing, such as glycol sebacate as a plasticizer for cellulose nitrate and polyacrylate resins as a finish base. G. M. K.

The Raman Effect and Its Chemical Applications

by James H. Hibben

American Chem. Soc. Monograph No. 80
Reinhold Publishing Corp., 330 W. 42 St., New York, 1939
Price $11.00 **544 pages**

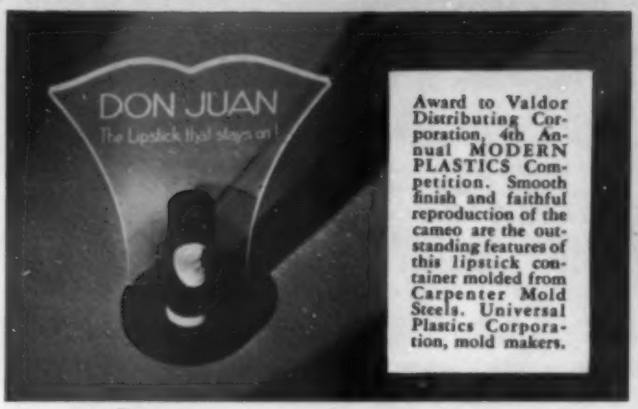
What is the *Raman effect*? How does it differ from *infrared absorption*? What is its relation to *fluorescence*? How can the *Raman effect* be used to explore the innermost parts of molecules and provide evidence of their structural make-up. The answers to these and many other questions and a wealth of data from the literature are presented in this valuable monograph.

Part I deals with the nature of the Raman effect, its relation to other physical manifestations, and the vibrations and rotations of polyatomic molecules. The major portion of this theoretical discussion was prepared in collaboration with Dr. Edward Teller, Professor of Physics at the George Washington University. Part II pertains to the Raman spectra of organic compounds and Part III to the Raman spectra of inorganic compounds. These are followed by a comprehensive bibliography and indices of compounds which serve to make readily available information regarding specific compounds.

The author believes that Raman spectra have contributed in large measure to the understanding of molecular constitution and molecular behavior. He has used this phenomenon to study the changes that take place during the polymerization of an ethylenic compound, methyl methacrylate. He hopes that his book will encourage the use of Raman spectra in solving problems in many branches of science. G. M. K.

A NEW CATALOG ON SEAMLESS FLEXIBLE METAL TUBING containing a pictorial collection of actual installations, concisely explained and supplemented by charts, tables and engineering data, is obtainable on request from American Metal Hose Branch of the American Brass Co., Waterbury, Conn.

Improve Plastic Finishes ...Sharpen Reproductions ...Step-Up Profits



Award to Valdor Distributing Corporation, 4th Annual MODERN PLASTICS Competition. Smooth finish and faithful reproduction of the cameo are the outstanding features of this lipstick container molded from Carpenter Mold Steels. Universal Plastics Corporation, mold makers.

It's easy to do exactly what you want and do it more safely when you follow the lead of prize winners and specify Carpenter Mold Steels.

It's easy because each Carpenter Mold Steel is controlled in the making to develop qualities that answer common mold making and mold using problems. For instance, suppose you are looking for a general purpose, case-hardening mold steel to take the brunt of your production. The steel you choose will have to have high strength, uniform and easy working qualities, and the ability to take and hold mirror finishes and give sharp reproduction of details. For such a steel, Carpenter's Samson is ideal. It is a clean, 100% acid disc inspected, uniform grain structure steel with just the right physicals to handle most of your jobs. This is the steel that the majority of prize winners use.

Whatever the job, whatever the problem, there is a Carpenter Mold Steel that can handle it easily and safely. So if you want better finishes, longer mold life and fewer rejections—if you want cleanness, uniformity, and easy workability put it up to Carpenter Mold Steels.

Find out now how much more you can do—how much you can save when you use these steels. Write today for our 18-page illustrated bulletin—"Mold Steels for Molded Plastics."

Here's a suggestion! While you are waiting for your copy of the bulletin ask some of your friends in the industry to tell you what *they* think of Samson.

THE *Carpenter* STEEL CO.
122 W. BERN STREET, READING, PA.

Makers of Fine Tool Steels Since 1889

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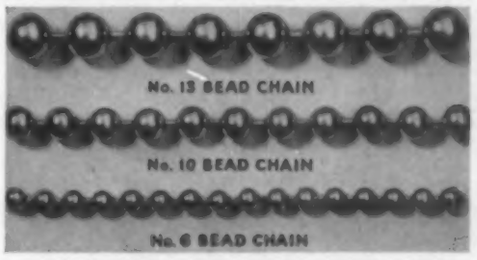

When we know your problem and you know the strength and appearance of non-kinkable BEAD CHAIN* it is more than possible that with your ingenuity and ours, BEAD CHAIN* may be most advantageously used with your product.

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NEWS

A NATIONAL EDUCATIONAL CONFERENCE ON PLASTICS AS applied to the design and decoration of interiors, to be sponsored by *Interior Design and Decoration*—the professional journal for interior designers—will be held December 11 and 12 at the Hotel Waldorf-Astoria, New York City, according to an announcement by Harry V. Anderson, editor of that publication. Supported by the entire plastics industry, the conference will present a group of well-known specialists who will discuss the subject of plastics from the standpoint of research, manufacturing, fabrication and the many phases of application.

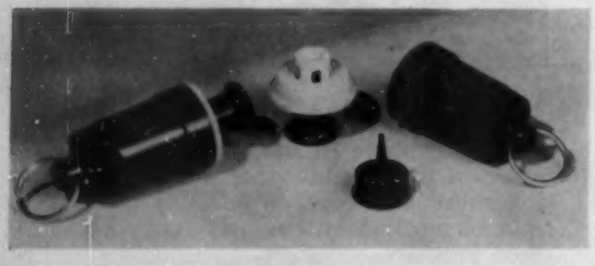
Speakers will include: Wm. A. Kimbel, president of the American Institute of Decorators, and head of A. Kimbel & Son, New York; Dr. D. S. Frederick of Röhm and Haas Co., Inc., Philadelphia; Dr. M. H. Bigelow of the Plaskon Co., Toledo, O.; Stephen J. Alling, architect of the Formica Insulation Co., New York; Dr. Harold DeWitt Smith of the Tennessee Eastman Co., New York; H. M. Richardson, head of plastics research for General Electric Co.; and Walter Dorwin Teague, industrial designer.

ANNUAL MEETING OF THE SOCIETY OF AUTOMOTIVE Engineers will be held January 15 to 19, at the Book-Cadillac Hotel, Detroit, Mich. The five days of sessions will cover many phases of the society's activities including aircraft, aircraft engine, Diesel engine, fuels and lubricants, passenger car and bodies, production, transportation and maintenance, and truck, bus and railcar. The passenger car body session will be one on Plastics and Dr. Gordon M. Kline of the National Bureau of Standards will be the principal speaker.

IMMEDIATE CONSTRUCTION OF A NEW PLASTICS RESEARCH laboratory in Springfield, Mass., by Monsanto Chemical Co. was announced recently by J. C. Brooks, vice-president in charge of the Plastics Division. The new building, designed to house the company's research staff and laboratory facilities, will be the first structure at the Springfield plant designed exclusively for research activity.

R. H. ALLEN, FORMER SALES MANAGER OF CONSOLIDATED Molded Products Corp., Scranton, Pa., has resigned from the company.

CHARLES E. WILSON, EXECUTIVE VICE PRESIDENT, WAS elected president and Philip D. Reed, assistant to the president, was elected chairman of the board of directors of the General Electric Co. at the meeting of the directors of the company in New York City, November 17. They will take over their new responsibilities January 1, succeeding Gerard Swope and Owen D. Young, who will become honorary president and honorary chairman of the board, respectively.



THIS *G-MAN SIREN* (ABOVE) ISN'T EXACTLY NEW BUT SINCE it is really the father of the automatic rotary Lauterbach press, it is interesting to note that its production has now passed the 6,000,000 mark. It is molded by John Lauterbach Co. from phenols and ureas and while the originals were molded on a laboratory press, subsequent orders came so fast that Mr. Lauterbach set to work to build an automatic compression molding press which would turn them out in suitable quantities to meet the demand. The result is the famous press now controlled by Owens-Illinois Company.

HYDRAULIC PRESS MANUFACTURING CO., MOUNT GILEAD, Ohio, has secured exhibit spaces 453 and 454 at the 17th Exposition of Chemical Industries held in the Grand Central Palace, New York, N. Y., December 4 to 9, where an H-P-M injection molding press in actual operation is on display. This is the Model 40-H-2 H-P-M injection molding press which has attracted so much attention at the New York World's Fair.

THE BOARD OF DIRECTORS OF THE HARBOR PLYWOOD CORP. announced the election of G. R. Birkelund as chairman of the board of directors, and E. W. Daniels as president. Huber F. Wise was reelected as secretary-treasurer. Mr. Daniels immediately assumes the duties of president in addition to his responsibility as general sales manager. Mr. Wise assumes the added responsibility of production and operation.

EXCLUSIVELY DEVOTED TO THE MANUFACTURE OF A VERsatile plastic material used by manufacturers of coatings, films, foils and plastics, a large new plant is now in operation in Midland, Mich., according to information just released by the Dow Chemical Co. This new plant produces Ethofoil, a clear glossy sheet material used for window packages, display container for foodstuffs and other commodities, and Ethocel, which finds a wide utility in molding plastics, lacquers, transparent films, hot melt protective coatings and other uses.

REED-PRENTICE CORP., WORCESTER, MASS., HAS BEEN HONored by the Associated Industries of Massachusetts with two 1939 merit awards for the development of its plastic injection molding machine and its magnetic heating cylinder.

HYDRO-POWER SYSTEMS, INC., MOUNT GILEAD, OHIO, DEsigners and builders of hydraulic machine drives, has recently established its general offices in the Grant Building, Pittsburgh, Pa. This move was made to centrally locate the company's sales and engineering activities and to facilitate closer working relations with its market consisting of press builders, steel machinery builders, machine tool manufacturers and special equipment.

JAMES P. SULLIVAN, FORMERLY WITH WATERBURY BUTTON Co., has organized the Connecticut Plastics Products Co., 124 N. Elm St., Waterbury, Conn. At present, the company is equipped for injection molding only.

THE FIRM OF JOSEPH SILVERS HAS MERGED WITH AND adopted the name of the Synthetic Plastics Corp., of which Mr. Silvers has assumed the presidency. The Synthetic Plastics Corp. will, as under its previous individual identities, combine now in the use of plastics for the manufacture of buttons, buckles and dress trimmings for the needle and allied trades. The new company will also give its attention to the development of new novelties in plastics of general, as well as trade application. With no change in personnel, but with a considerably enlarged staff, the consolidate organization occupies spacious quarters at 461 Eighth Ave., New York.

CARBIDE AND CARBON CHEMICALS CORP., A UNIT OF UNION Carbide and Carbon Corp., has developed calendered sheets of *Vinylite* plasticized resins, said to have many advantages, and few of the disadvantages, of leather and rubber. These sheets offer possibilities for numerous applications heretofore removed from the plastics industry. The material—suitably plasticized copolymers of vinyl chloride and vinyl acetate—can be supplied colorless, or in a wide variety of transparent or opaque colors.

The new, highly plasticized materials are flexible to the point of withstanding folding and repeated flexing is reported. Elongations up to 250 percent, with a tensile strength of 3000 lbs. per sq. in. are readily obtained. The sheets are unusually tough and show interesting elastic properties. Stretched appreciably, the sheets return slowly to their original dimensions.

FLOWERS MADE OF PLASTACELE CELLULOSE ACETATE plastic, a du Pont material, have been made with perfume incorporated into the plastic in such a way that it lasts for weeks and even for months,

SPEED — ECONOMY — PRESSURE

Grotelite Triple Pump Injection Press

COSTS LESS TO RUN

Because while the momentary current during injection may go as high as 40 H. P. (this greater horsepower, made available at the moment of injection, is one of the reasons why Grotelite has the fastest injection speed), it is only 2 H. P. during a large portion of the molding cycle and during all idling time.

May we tell you more about this money saving feature and other important advantages?

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according to Madame Vago of Artistic Creations, Inc., designer and manufacturer. The flowers are hand painted in iridescent, metallic, and shaded effects. They are designed for costume jewelry, hair ornaments, and dress accessory use. The perfume is incorporated during the process of shaping the plastic to make the flowers.

ELMER E. MILLS CORP., INJECTION MOLDERS AT 812 WEST Van Buren St., Chicago, Ill., has recently doubled its manufacturing space. A little over two and one-half years ago this company started with two injection machines. Now its operating facilities have been increased over three and one-half times and its personnel considerably enlarged.

ROBERT E. DILLON, PRESIDENT OF THE LAKE ERIE ENGIneering Corp., manufacturer of hydraulic presses, has been elected a director of the Marine Trust Co. of Buffalo, N. Y.

WE REGRET THAT, THROUGH ERROR, IN OUR OCTOBER issue we took undue liberties with the name of The Metal Specialty Co. who molded the lenses illustrated on page 39. We also learn that the listing of its address in the Directory section was incorrect. The correct address is Este Ave., Winton Place, P. O. Cincinnati, Ohio. The company also informs us that it is now installing a new 18-oz. multiple nozzle H. P. M. injection molding press which will be operating by the time this reaches print.

LISTS SHOWING IMPORTERS OF SYNTHETIC ORGANIC CHEMIcals into Argentina, Brazil and Chile have just been issued. These are available for the nominal charge of 10 cents each upon application to the Chemical Division, Washington, D. C., or any of the District or Cooperative Offices of the Bureau of Foreign and Domestic Commerce.

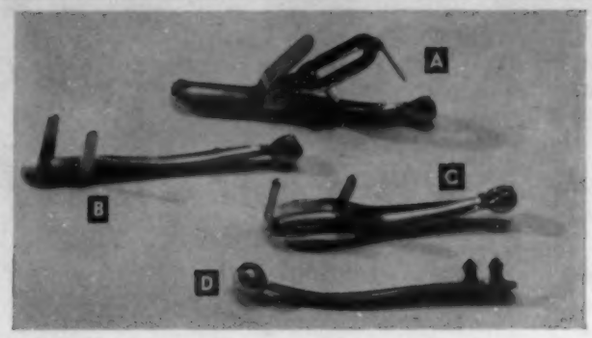
AT A RECENT MEETING IN PRESQUE ISLE, MAINE, EIGHT hundred Aroostook farmers and business men heard an announcement that a method has been developed for converting Irish potatoes into plastics. Responsible for the new process is Dr. Joseph Seiberlich, a German chemist residing in America. The plastic material, which can be made from culled potatoes, includes a type resembling crystal-clear glass. The State Department of Agriculture and the Maine Development Commission have provided $5000 to advance investigations. A pilot plant is now under construction at Belfast, Maine.

A SPECIAL TRIPOLI COMPOUND WHICH HAS THE SHARP cutting action necessary to remove the fins or major imperfections in molded plastic products has been developed by Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturer of buffing and polishing compositions and wheels. This compound, it is claimed, has the property of giving the fast cut required to eliminate burning and dragging of the plastic. This company has also developed "cut and color" compounds for work which calls for less finishing or on which the molding operation has produced a higher finish.

JACKSON-ALDEN ASSOCIATES, LINCOLN LIBERTY BUILDING, Philadelphia, Pa., have joined the Gorham Co., Providence, R. I., as sales representatives for the Plastics Div. in the middle Atlantic states.

ARRANGEMENTS HAVE BEEN COMPLETED BETWEEN CARbide and Carbon Chemicals Corp. and American Viscose Corp. for the production of Carbide's new *Vinyon* synthetic resin yarn. It is stated that Carbide will manufacture the resin powder, while American Viscose will convert the powder to staple fiber and continuous filament yarns. Production facilities of both companies are already in operation, and manufacture of the new fiber is well under way.

A CHEMICAL DEVELOPMENT WHICH WILL PROVE OF VALUE to American industries using rubber latex, particularly during the present trying times, was announced today by Monsanto Chemical Co. By the use of Santobrite (Monsanto's sodium pentachlorphenate) with a very small amount of ammonia, it will be possible effectively and economically to preserve latex at the plantations in the tropics, and maintain it preserved during transportation and storage, it is reported.



METAL CLIPS WHICH CAN BE ATTACHED TO PLASTIC COMBS, pens and similar objects are being manufactured by Merit Display Card Co., 36 W. 20 St., New York, N. Y. Included are the spring clip (*A*), streamline-long prong clip (*B*), ball clip (*C*), and streamline-short prong clip (*D*), shown above.

CELLULOSE ACETATE MOLDING COMPOUND PRODUCTION jumped from 5,500,000 lbs. to 9,250,000 lbs. during the first 10 months this year according to recent Department of Commerce figures. Sheets, rods and tubes show a gain of about 3,000,000 lbs. during the same period. Nitrocellulose sheets are up about 1,000,000 lbs., while rods and tubes production remained about the same as 1938.

AN EXHIBITION OF USEFUL OBJECTS UNDER TEN DOLLARS, stressing new materials, plastics in particular, and the new forms most suitable to these materials, opened December 6, at the Museum of Modern Art, 11 W. 53 St., New York, N. Y.

FREDERICK S. BACON, FORMERLY ASSOCIATED WITH GUStavus J. Esselin, Inc., has equipped a laboratory for general consultation work specializing in plastics, adhesives, organic research and sales development, at 192 Pleasant St., Watertown, Mass.

STUDIO OF INDUSTRIAL DESIGN, 235 PINE ST., SAN FRANcisco, Cal., has formed an organization to serve Pacific Coast suppliers of raw materials and molders with a designing, and styling service.

JUAN A. ALVAREZ, EMPARAN NUM. 5, VERACRUZ, MEXICO, is desirous of representing American manufacturers of plastic molded items, according to a letter we received from him during the past month.

DAVID C. WILLIAMS, SALES REPRESENTATIVE OF TENNESSEE Eastman Corp. in the Buffalo area has opened an office in that city at 1508 Rand Building. The telephone number is Cleveland 3750, and there will be teletype service to the Kingsport, Tenn., home office. The Buffalo area includes the western portions of the states of New York and Pennsylvania.

WILLIAM M. LESTER HAS RESIGNED AS GENERAL MANAGER and chief engineer of Commonwealth Plastics Co., Leominster, Mass., to organize the Pyro Plastics Co., at Westfield, N. J., of which he is general manager. The new company is setting up a model installation of the most highly developed injection molding machine and will engage in custom injection molding. Mr. Lester is a son of Nathan Lester of the Lester Engineering Co., Cleveland, Ohio.

A STUDY BY THE CHEMICAL DIVISION OF THE BUREAU OF Foreign and Domestic Commerce shows that the occupation of Poland by Russia and Germany gave the latter country almost complete domination of the Polish chemical industry, according to a report by James W. Young, Bureau director.

The annexation by the Reich of the former German territories of Eastern Silesia with Kattowitz and Danzig makes the entire Silesian coal fields and chemical area an economic entity. The "German zone of interest" also includes the greater portion of the new industrial center of Poland located between the tributary Pilica, the Bug River, the Beskid mountains and the Vistula River. Products of military importance such as explosives, ammunition and nitrogen compounds are turned out in the Sandomierz district.

GENERAL NATHANIEL GREENE WAS WELL PREPARED Years in advance, General Greene saw the American Revolution was inevitable and began studying military science. When his state, Rhode Island, entered the war, General Washington acknowledged that Greene's troops were the best disciplined men in the whole army.

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Whatever your requirement in molded plastics, you will find General Industries fully prepared to fill your needs efficiently and at low cost consistent with high quality. Our equipment is modern in every particular and our engineers have had long experience in producing molded plastics. Our facilities are sufficiently large to meet your control requirements in any quantities, yet not so large but that every job can be given executives' attention.

You can confidently rely on General Industries for unusual accuracy and exceptional finish, at lowered costs which assure worthwhile savings.

Give us the chance to prove our claims by submitting blue prints and specifications.

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NATIONAL N DYES

Resin Dyes

HOLDING ALL RECORDS

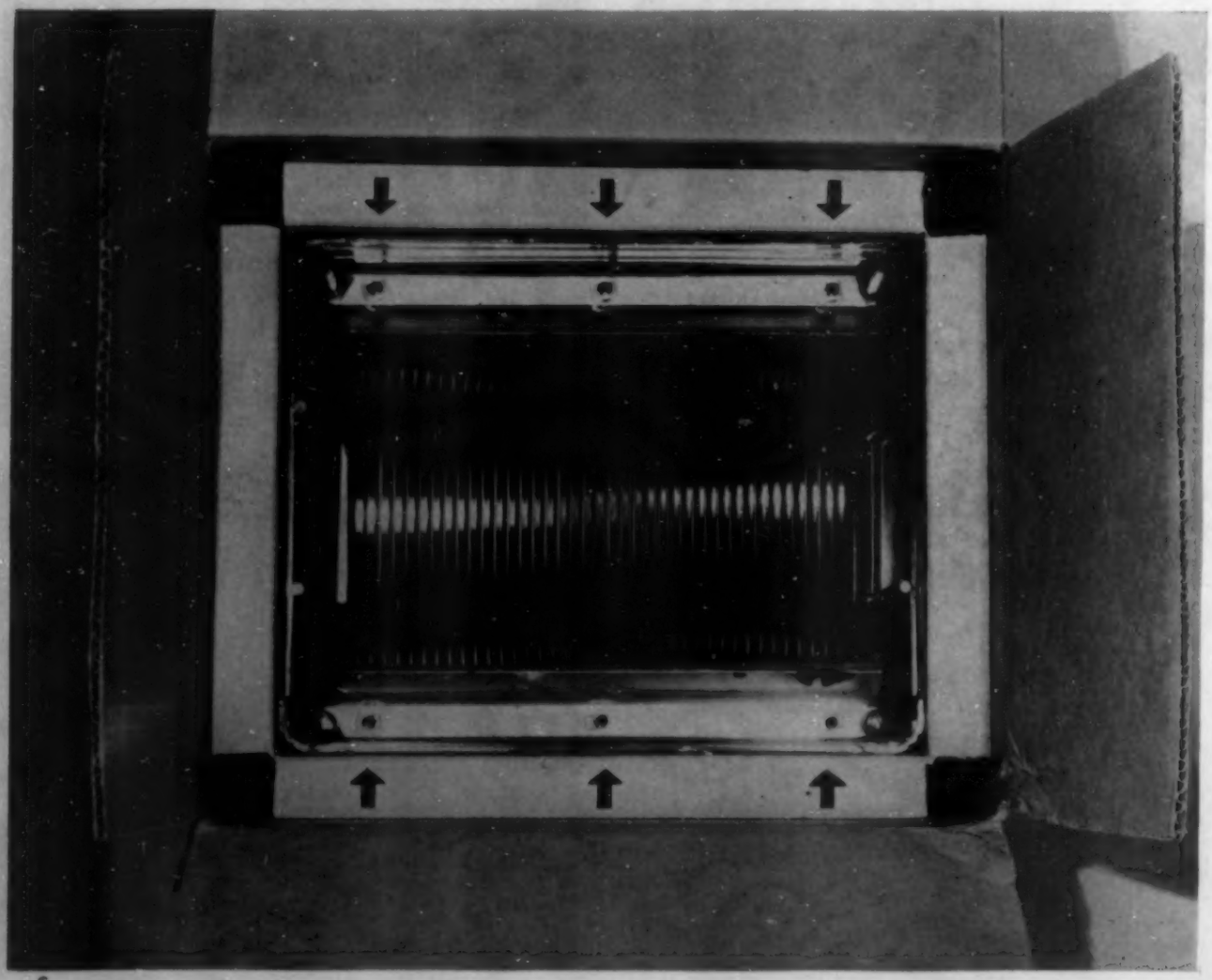
(*Continued from page 34*) the 40 record separations—had to be figured out individually as the work progressed. And this is the way it was accomplished.

The mold was designed and built in sections. The center portion of the cavity is a U-shaped piece carrying 39 curved record spacers placed $^{5}/_{16}$ of an inch apart, while the ends are separate blocks of machined and hardened steel. To eliminate parting lines and assure smooth surfaces in the finished part, the spacer grooves in the center portion were cut from solid steel blocks in a Keller machine, with a special arbor fitted into the spindle of the machine. The ribs are not radiated from the center, being deeper at the sides than in the middle, and varying from $^{3}/_{8}$ in. at the bottom of the cavity to $^{1}/_{2}$ or $^{5}/_{8}$ in. at the top. Consequently, they could not be cut by conventional methods but it was necessary to follow the form all the way around.

When it came time to harden this part, complications began to slow up the procedure. Heat applied to the U-shaped block of steel—complete with ribs and a mass of steel across the bottom—caused the block to contract, pushing out the sides. A technique had to be devised to press them back into place again without cracking the steel. This was accomplished finally by admitting just the proper degree of heat to certain spots, accompanied by slow even pressure. Once machined and hardened, the different sections were assembled by dropping them into the steel containership.

The plunger of the mold, also, had to be cut automatically in a Keller machine since it did not have true

This bird's eye view of the record holder, packed bottom up in a shipping container, shows how assembly is simplified by Tinnerman Speed Nuts. The molded part is shipped to the RCA plant, unsealed, where an operator lifts the flaps of the container, inserts two metal strips with sponge rubber bumpers already attached, and fastens them permanently in place by simply pushing six speed nuts over the six plastic bosses which are precision molded in the bottom of the rack. The assembly is completed in a matter of seconds, the flaps are sealed and the carton is ready to ship



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in a quality which meets and exceeds the purity specifications for Reagent Grade. Carboys—Drums—Tank Trucks—Tank Cars.
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➡ PLASTIC MIXING & MOLDING EQUIPMENT—Factory rebuilt—Hot Rolls or Mixing Mills, Hobbing and Die Sinking Presses, Semi-automatic and Standard Molding Presses, Hydraulic Pumps, Accumulators, Intensifiers. Reply Box 294, Modern Plastics.

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➡ WANTED IMMEDIATELY: Large Molding Presses, Multiple Ram Presses, Injection Presses, Hydraulic Pumps, Hydro-Pneumatic Accumulators, Preform Machines, Pebble Mills, Mixers, Sifters, etc. WILL PAY CASH. We carry large stocks of Plastics and Hydraulic Equipment. Send us your inquiries. Reply Box 220, Modern Plastics.

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➡ WANTED: Stainless Steel or Nickel Kettle, Vacuum Pan, Hydraulic Press, Preform Machine and Mixer. Reply Box 275, Modern Plastics.

•

➡ FOR SALE: Watson-Stillman Hydro-Pneumatic Accumulator, 8″ ram, 48″ stroke, 42″ air cylinder, 5000 lb. PSI, complete with high pressure air receiver and interconnecting fittings; 4—Watson-Stillman 4-cylinder opposed Hydraulic Pumps, 6000 lb. PSI, 25 GPM, motor driven. 100 HP AC motors; 6—24″ x 24″ Hydraulic Presses 12″, 14″ rams; 2—30″ x 30″ Hydraulic Presses, 14″ rams; 60″ Mixing Rolls. Reply Box 326, Modern Plastics.

•

➡ WANTED: CELLULOSE ACETATE SCRAP, unground or reground, as well as lumps, also acrylic or methacrylic resin scrap and celluloid scrap. Send details concerning quantities and price. Reply Box 318, Modern Plastics.

•

➡ WANTED—Injection molding machines with moderate capacity. Also could use as many as four hydraulic presses for compression molding with 10″ rams. Please furnish full details as to type of equipment, condition and price. Reply Box 323, Modern Plastics.

➡ Young man, 33, single, wishes Sales Position with Molder or Material Manufacturer. Engineering training, knowledge of blue prints, good salesman. Has adaptability. T. J. Gleason, 49 Hodge St., Buffalo, N. Y.

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➡ RESEARCH WORKERS: We offer every cooperation, assistance and counsel in developing new ideas applying to ceramic products of all kinds. . . . Write or call at our office, where complete laboratory and technical facilities are available. Reply Box 311, Modern Plastics.

•

➡ ENGINEER WANTED: Experienced in extruding plastic materials. Reply Box, 325 Modern Plastics.

•

➡ FINANCIAL EXECUTIVE seeks connection with future in plastics industry. Fourteen years intensive experience in following, interpreting and anticipating economic trends, in preparing statistical studies, comprehensive reports and analyses, in supervising investment portfolios and in making field investigations of industrial corporations. Demonstrated sound business judgment. Adept at market analysis and preparation of sales pamphlets, brochures, etc. Accustomed to handling voluminous correspondence, wires, inquires. Honor college graduate, married, 33, Christian. Reply Box 327, Modern Plastics.

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➡ For sale 7 Automatic Drilling Machines and 8 Grinding Machines for making Catalin beads from 6 mm to 16 mm. Apply for prices and particulars Box 328, Modern Plastics.

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➡ YOUNG MAN 28 years of age, married, would like to become associated with reliable molding company or plastics manufacturer who offers a position with a future. Has been connected with leading plastics manufacturer for last 6 years. Factory trained. Three years selling, 1½ years Product Consultant and Sales Correspondent experience. Available immediately. Full particulars and references given upon request. Reply Box 329, Modern Plastics

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Read How . . .

- "Savings made possible the use of plastics instead of die castings, improving the piece and paying for the machine in 100 days."
- "Eliminating a conventional multiple-cavity mold paid for an Automatic Molding Machine and its mold."
- One manufacturer "Cut the cost of moldings from $60. to $12. per thousand" (for all material, power, heat and direct labor).
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You'll find details of these and other "Case Histories," facts, figures, engineering data and other pertinent information . . . also descriptions of machines, how they operate, specifications, etc. . . . all in our new catalog No. 906. Write for it.

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contours or radii to work from. This cutting process involved was quite slow, but it was the only way the work could be done. Then followed a tremendous amount of hand finishing—scraping, filing and polishing before the completed mold, weighing some 2500 lbs., was ready for use.

Next came the selection of a plastic material suitable for the purpose. Because of the shape of the piece and the ribs, the task of making the plastic flow and fill the mold properly was one that took time and actual compound development work to accomplish successfully. The plastic compound had to be fast curing for good flow lines, and it couldn't be too brittle. The wood filled material eventually adopted has been found to have all the necessary qualities.

The record rack is molded bottom side up in a 24-in., 750-ton hydraulic press. A combination of powder and preforms, not preheated, is used to load the die. Powder is distributed as evenly as possible in the bottom of the cavity and the mold is closed part way until the softened plastic material starts to flow up the sides. Then from the ends of the die, preforms are placed in the correct position to fill in around the side walls, and the mold is closed completely.

The first few racks to emerge from the die were a bit disappointing because the separations in the center had a tendency to close in as the piece cooled. This difficulty has been overcome by removing the flash, which forms between the ribs, the minute the rack comes from the press allowing air to circulate freely and speed along the setting process. A fixture built to give support between the ribs, holds the piece in shape while it cools. This form is kept in place only during one molding cycle.

The molded rack requires little finishing other than cleaning between the ribs which is done by hand with a brush buff. No buffing is done around the outside.

The gold trademark and numerals 1 to 40, identifying the record slots, are printed inexpensively by machine. Here again, standard plastic printing practices had to be developed further before the decorative work could go on satisfactorily.

"We took the RCA record rack job," says William Milton, sales manager of General Electric Co.'s Plastics Dept., "primarily to prove to ourselves that a difficult molding of this type could be done successfully. It was really a test job for our own department all the way along the line from construction of the die and development of the best possible type of compound, to molding technique, printing and finishing."

More than 10,000 of the record racks which are being made in just one color, a mottled brown, have been completed. They are packed for delivery to RCA Manufacturing Co. in such a manner that assembly can be accomplished without removing the racks from the shipping container. It is simply a matter of opening the carton, and inserting a rubber bumper plate backed by a steel strip locked in place with speed nuts. These speed nuts have no threads but are made with spring slots which slip over molded bosses, and no special tools are necessary for assembly. All that remains is to close and seal the carton for shipment to dealers.

VULCANIZED-FIBER-PHENOLIC TUBES IN HIGH VOLTAGE ENGINEERING

(*Continued from page 47*)

Application

Lightning Arresters. In Fig. 1 is shown a cross sectional view of a combination tube used as a lightning arrester. This is the construction of General Electric Co.'s expulsion protective gap. Essentially it consists of a fiber-phenolic combination tube with metal electrodes threaded to each end. The upper electrode consists of a metal rod attached to a metal head and extends into the interior of the tube as shown. The lower electrode has a vent through which the gases generated by the arc are expelled. The device is mounted and connected to ground by this lower electrode. The breakdown voltage of the air gap inside the tube is less than that of the air outside or the apparatus connected in parallel with it, hence, lightning discharges take place within the tube. The tube is isolated from the line by a series air gap which prevents full line-to-ground voltage from being continuously applied to the tube.

In Figs. 2–3 are shown typical installations of these expulsion protective gaps. Fig. 3 is a very interesting picture for it shows the gases being expelled from protective gaps, mounted as shown in Fig. 4, during field tests. These gaps are interrupting approximately 1400 amperes at 132 kilovolts.

With the type mountings shown in Fig. 4 there are two places in the arc stream where interruption can occur independently. The space between the protective gaps of Fig. 4 has the same purpose as the external gap shown in Fig. 1.

Fuse Cutouts. In Fig. 5 is shown a cross sectional view of the general construction of fuse cut-out tubes. They consist essentially of a combination fiber-phenolic tube whose one end is closed with a threaded metal cap while the other end is left open. In the interior of the tube is the fuse link which is connected to the threaded head and extends through the open end to the outside of the tube where it is connected to an outside terminal.

The operation of these tubes can perhaps be better illustrated by referring to Fig. 6, which shows such a tube mounted in a fuse cut-out device. There is a fuse link which extends through the open end of the tube, holds a trip mechanism in position and also is connected to the outside terminal. Under an excess current the fuse link blows and produces an arc which is extinguished by the generation of gas as described above. The generated gas is expelled through the open end of the tube. When the link severs the trip mechanism falls, thus releasing the fuse tube which falls out of the housing as shown. The tube in this position is easily seen by the service men who need merely to replace the link and reset the device. It is then ready for the next operation.

In Fig. 7 is a view of another type of cut-out not enclosed in a housing as in Fig. 6. The principle of operation is similar to that of the device shown in Fig. 6. This view shows the tube in the closed position, before

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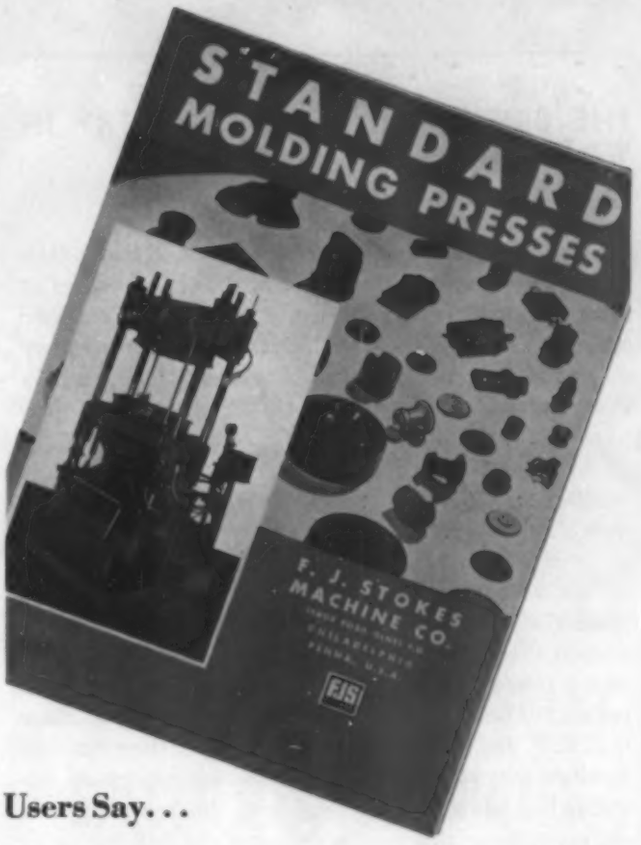

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contact is made and the trip mechanism released by the link. It is to be particularly noticed in these cut-out fuse tubes that the wall of the fiber liner is a relatively small part of the total wall. This means, of course, that the metal heads must be threaded to the phenolic portion. The phenolic part of these tubes must, therefore, be not only strong enough to withstand the internal impact stresses set up by the spontaneous generation of gas acting on the wall of the tubes, but must also have strong enough threads to prevent the threaded heads from blowing off during an operation.

THE BRITISH PLASTICS INDUSTRY IN WAR TIME

(Continued from page 27)

Apart from the extra cost of materials, and the price fluctuations from week to week, there is bound to be an increase in manufacturing expenses owing to at least two causes. The first is the Government's compulsory scheme of war risk insurance. The scheme provides for a charge at the flat rate of thirty shillings percent in order to cover the risk of loss or damage by enemy action (due primarily to air-raids) for three months. This charge at the rate of £6 per £100 per annum is considered very severe indeed and to compensate for this direct loss of revenue the manufacturer has to increase his prices by at least an equivalent percentage. It is hoped that the present scheme will be amended and that after three months the scale of payments will be revised or the payments already made will be deemed to cover a longer period. Another expense incurred by the manufacturer is A. R. P. and firms employing only two or three hundred workers are obliged to spend considerable sums on providing black blinds for all the factory windows and making proper provision for the shelter of the staff during air raids. This usually takes the form of specially strengthened basements or dugouts on land available at the back of the factory. Where large basements are available these are often kept open to the public and classed as public air raid shelters. Most shelters are provided with seating accommodation, conveniences, lighting and radiogramophones, etc. Then again, all fire-fighting equipment has to be overhauled and supplemented and some of the larger firms have their own fire-fighting squad properly equipped with pumps, etc. It must not be imagined for a moment that the increase in prices to be expected in the industry will be in the region of 50 to 100 percent; on the contrary, at the outset at all events, a 5 percent increase is all that is expected. This is confirmed by the announcement just made by The British Xylonite Co., Ltd., that, owing to increased expenditure due to War Risks Insurance, A. R. P. expenditure and packing materials, etc., all invoices will be the subject of a 5 percent surcharge.

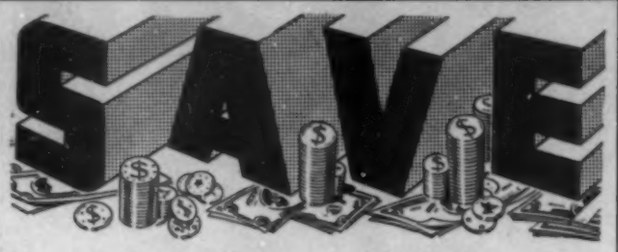
Another factor with which the British plastics manufacturer has to contend is that transport facilities are by no means normal as a large number of trucks have been taken over by the Government for essential national service. Use of trucks retained by individual firms must be restricted in use owing to the enforcement of a fuel rationing scheme. This has, however, been worked out on fairly elastic lines so as to give the maximum assistance to vital industries and the plastics industry should be able to obtain reasonable allowances of fuel.

Owing to the energetic action of the British Plastics Federation, the Ministry of Labor has agreed to exempt from national service men of 30 years or over who are actively engaged in the industry. Thus firms are secure in the knowledge that key men, such as foremen in charge of all processes of manufacture and other skilled or semi-skilled men will not be liable to be called up. It is realized, of course, that the exigencies of war may possibly make it imperative to increase the age limit to 35 or 40 years.

The British plastics industry is to-day facing the future with complete confidence. It is realized, of course, that some grim days are ahead and that production may be seriously handicapped through one cause or another, but there is no doubt at all that this war presents a golden opportunity to the industry to show what contributions can be made to the national life.

Present Availability of Plastic Materials in Great Britain

Resin	Quantity Available	Source of Supply
Phenol formaldehyde resins	Large quantities available	Great Britain is one of largest producers of phenol in the world. Not only are the coal tar distillers able to supply very considerable quantities, but there is in operation an important synthetic phenol plant using the sodium phenylate process from benzene.
Urea	" " "	The Imperial Chemical Industries have the plant to make urea from synthetic ammonia as well as synthetic formaldehyde. Three well known firms are manufacturing urea formaldehyde resins.
Casein	" " "	Two or three firms produce casein but most of it is imported from Europe and the Argentine.
Celluloid	" " "	High production in this country but all cotton is imported.
Cellulose Acetate	" " "	High production in this country but all cotton is imported.
Methacrylate	Medium " "	Sufficient for needs made in Great Britain by I. C. I.
Styrene polymers	" " "	Most of this was imported from Germany but now one large concern is producing excellent quality material.
Vinyl chloride	Small " "	Practically all imported from Germany, but now that the I. C. I. have produced their new resin Polythene this will meet all requirements previously satisfied with Mipolam.
Vinyl acetate	" " "	The whole of this imported from Canada and U. S. A.



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Metasap Metallic Soaps solve both of these problems—and in addition supply a desirable plasticizing effect.

METASAP CHEMICAL CO.

HARRISON, N. J.

CHICAGO CEDARTOWN, GA.

4

5

6

To reduce maintenance costs for walls open to direct customer contact, Formica wainscoting is used on stairways (5) and lower selling floor (4) of the Grant store. Edge-lighted interior signs (6) have letters cut from Monsanto fluorescent plastic, which project from the background, picking up and reflecting light

BACKGROUND FOR MERCHANDISING

(*Continued from page 29*) all-through color blend with the stainless steel backbar, and continuous mirrored columns. A focal point of interest is the ninety-foot mural, depicting in colorful and abstract array, fruits, vegetables and delectable tidbits.

The comfortable, luxurious Ladies' Lounge on the mezzanine is approached by a white bronze staircase. A huge recessed display for promotional and seasonal merchandise is strategically placed on the first landing. In the lounge, one entire wall is given over to the forty-foot window with its five section forty-foot Venetian blind in alternating tones of white and coral. Another wall is panelled in laminated wood veneer and features a mural in vibrant, vivid colors which depicts the city of Buffalo, locating graphically all points of interest and other stores of the company. Harmonious furniture and accessories complete the feeling of relaxation.

Three staircases lead to the basement selling area. Planned as a series of colorful vistas, the basement is equipped and furnished with the same modern materials and lighting fixtures as the upper floors. The walls make use of basswood veneer wainscotting and off-white paint with coral for soffits. The ceiling is white and the floor is of Terrazzo.

In designing the new W. T. Grant store, serious consideration was given to the factor of obsolescence. In choosing materials and paint color an attempt was made to reduce the maintenance cycle to a minimum. The decorative laminated plastic materials, sanitary and long-wearing, combine well with the other hard surfaces used, and are functionally adaptable for modern architectural installations.

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Since 1918 leading molders have recognized this firm as the outstanding specialists in the manufacturing of molds for plastic materials, in die-sinking, engraving and hydraulic hobbing. (Capacity 2500 tons.)

Our plant is Keller, Gorton & Blanchard equipped for the most economical and speedy production of superior molds.

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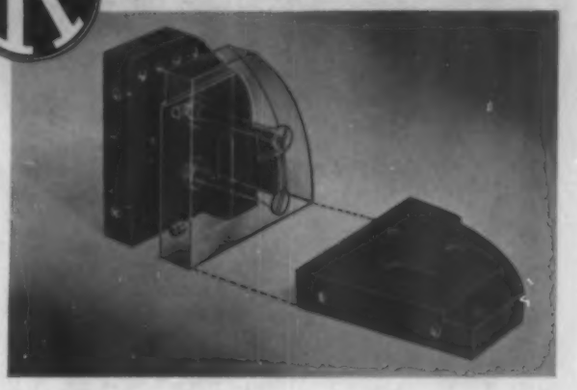
An Inside Story



Experts in design, engineering and the mechanics of moulding at K & J will X-ray your moulding problems and give you a complete picture of the economics effected by K & J "straight-line" production—design, mould-making and moulding the finished piece. Write for full information.

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Just show us that tough problem

You may be aggravated by a molding difficulty—or perhaps you have a regular run-of-mill part needing a good molded job.

Either way, our talented technical and design staff (with 20 years of experience) will gladly, without obligation, indicate its ability to bring you a successful answer.

And our fine molding plant is always ready—and capable—of turning your blue prints into actuality, whether in phenolics, ureas, acetates, acrylics, cold molded, or any other leading plastic materials.

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—until you check costs with this economical method!

If it's round and small, make it on an automatic screw machine from Ameroid Rods—and save expensive mold charges. Ameroid is easily turned, threaded, drilled and polished. Non-inflammable.

Ameroid Casein Plastic Round Rods are available from stock in a large range of plain colors, also Black and White. Ground to desired diameter from ¼" to ¾", inclusive, and as small as 1/16" to order.

If you are not equipped to turn the parts, experienced fabricators will do it economically. Write for samples of radio parts, knobs, bushings, fishing reel handles, etc., made on screw machines with Ameroid Round Rods.

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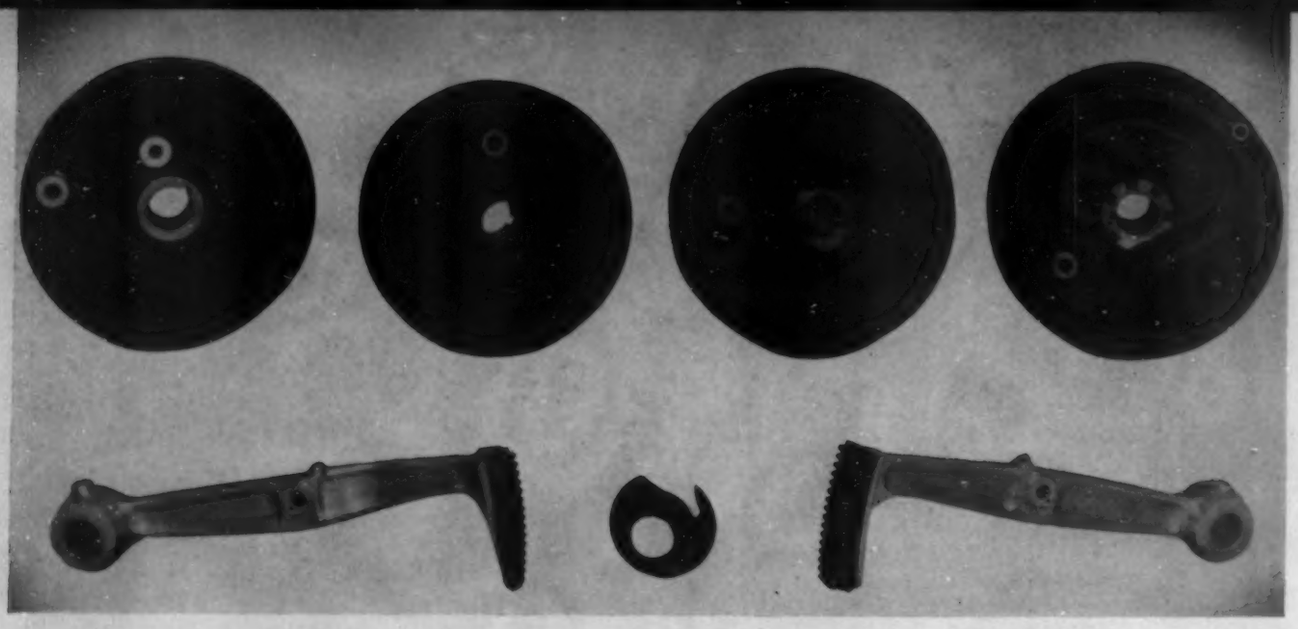

Here are the four Textolite cams showing the irregular cam tracks which must be molded to extreme accuracy. Left to right they (1) operate awl and looper; (2) control tension; (3) actuate needle and presser foot; and (4) pull thread through and operate the lock. Lever arms with laminated gear sectors and molded shuttle are shown in the bottom row

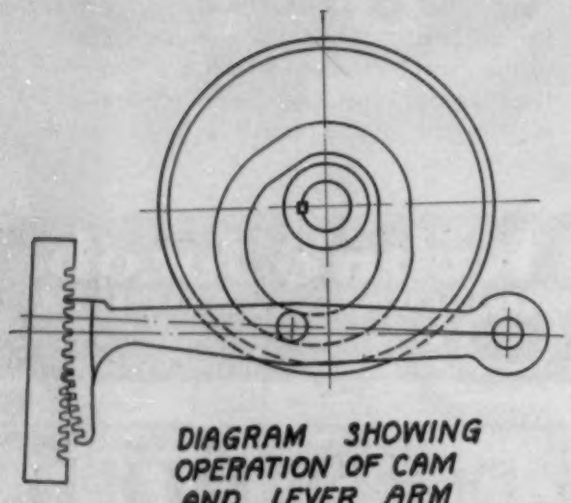

DIAGRAM SHOWING OPERATION OF CAM AND LEVER ARM

NEW MATERIAL FOR SPEED CAMS

(*Continued from page 31*) brought to light any material that had a tendency to develop cut fibers or indentations. It was found that the special cam material (listed as No. 4 in these tests) developed much less internal friction heat than other non-metallic blanks.

Another test, designed to find the ultimate life of the cam and the lever arm operated by the cam, was set up with approximately 125 percent overload and run at about double the regular speed. The test ran over 4,250,000 cycles or the equivalent of about 16 years' service in an ordinary repair shop. It kept on running up to 6,000,000 cycles and even at that, the cam shows no sign of fatigue and apparently is good for as much more service as it has already stood. This indicates that the cam made from the special phenolic compound will probably outwear any other moving part of the machine.

There are four of these molded-laminated cams in the head of the new Goodyear Stitcher and the same material is used for cam lever arms, shuttle, backing plate and other accessory parts. The cams may be made of either laminated or shredded material, or a combination of the two, pressed to shape in specially constructed molds. Perhaps the combination of shredded material in the center with laminated blanks on each side, gives the best results and the cam used in the life test, referred to above, was made in this manner. By this method, the laminations on the two sides form over the cam track to give a smooth, even surface while the shredded material flows readily at the plastic stage to fill the mold completely and insure a perfect bond with the hub or other inserts.

The top and bottom plates of each of the four molds used in producing the cams are drilled for the passage of steam, while the shell is steam jacketed thus leading the heat to the piece from both sides and the outer surface, reducing to a minimum the time required for molding. The molding operation must be carefully controlled for if heat and pressure are applied suddenly, the plastic part is likely to rupture. By warming the material thoroughly, or until it approaches the plastic stage, and then applying pressure, this condition is prevented.

With the many and varied motions produced through the cams and attachments, it becomes necessary that the cams be in as near perfect balance as is commercially possible. In the manufacture of the plastic molded cam, this was accomplished by first making a standard cast iron cam to be used as a pattern, and milling out material in the proper places until it was perfectly balanced. The molds were then machined to produce a piece exactly like the cast iron master except that allowance was made for a slight finishing operation in the cam track. Therefore, the plastic piece is in perfect balance as it comes from the mold with no special machining required other than the simple finishing of the cam tracks.

Accuracy of molding is of major importance in the production of these practical cams. The special phenolic laminated compound is so processed before the cam tracks are finished that no further shrinkage or distortion will take place when the cams are in operation. This is done to remove molding strains and increase the machin-

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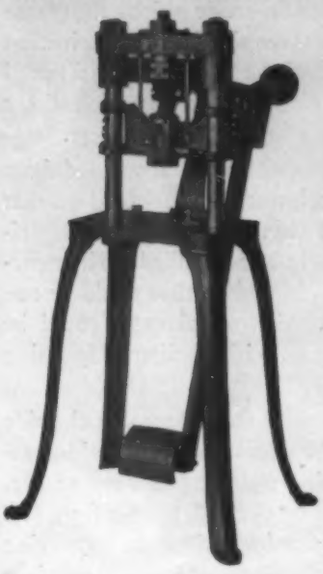
LITTLE GIANT TOGGLE PRESS



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It has a long stroke and a wide working range. The head is equipped with knockout. All wearing parts, pins, and links are hardened.

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Eliminates traps.	Ample heat for peaks.
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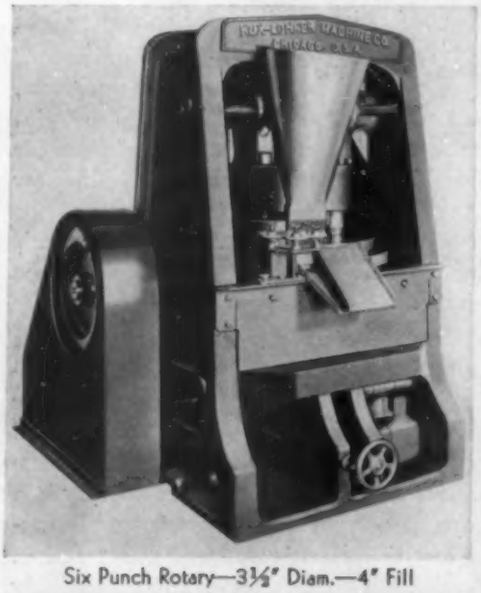

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THE COUNTRY'S LEADING MAKERS OF COTTON FLOCKS

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ability of the material. The insertion of graphite in the compound is precisely regulated to provide the proper amount to insure easy lubrication and at the same time maintain the full strength of the material as compared with graphite-free compounds made with the same fabric base. The plastic cams require far less lubrication than previous metal types and the amount they do need is supplied from jets in the machine head which direct a tiny spray of oil to the bearings and cam rollers.

Trials were made first on simple cams machined from sheet material, and then followed disks molded on cast iron hubs. From the data obtained from these experiments, more complicated cams were molded. Their success was at once apparent. Machines that could be run only at 125 to 150 r.p.m. with metal cams could be speeded up to 450 or 500 r.p.m. with no distress by using the plastic cams.

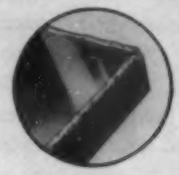
Some of the cams have several tracks, two on the side and one on the outer periphery and operating reciprocating parts such as the piercing awl for soles, the needle, cam levers with gear sectors on the end, presser foot, etc. With the increased speed required, these reciprocating parts, operated by the cam, demanded less weight to reduce strain and noise. Because of the rigidity necessary, the United Shoe Machinery Corp. engineers specified a forged Duralumin lever with a plastic gear sector molded on the end. A perfect bonding was accomplished and no loosening has shown up even in the most strenuous service. The steel drop forged lever arm formerly used weighs 765 grams while the present Duralumin lever, with its molded gear sector, weighs 388 grams, or only about half as much.

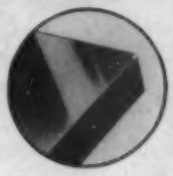
The service of the awl lever is particularly severe. Driven by means of the gear sector, it pierces up to $^5/_8$ in. of sole leather at the rate of at least 300 stitches per minute. On machines operating on thinner leather for women's soles, this speed is increased to 450 and 500 r.p.m., and in one particular type used in the women's shoe production, it is expected to attain a speed of 1000 stitches per minute.

Through exhaustive tests and actual service, the United Shoe Machinery Corp. reports that the molded-laminated parts in its Goodyear Stitcher are responsible for an impressive list of improvements over the metal members they replace. For example, the plastic cam weighs only about 20 percent as much as its cast iron predecessor, costs 30 percent less to install, and has remarkably low inertia for fast (stop and start) action. Noise and vibration has been decreased to an amazingly low degree. Metal to metal contact with its resultant fatigue has been eliminated and constant lubrication is no longer necessary. The adoption of plastic parts permitted an increase of 200 percent in the speed of the machine and even an overload of 50 percent produces no evidence of distress. Uniform structure in cam track side walls is easily achieved and the molded tracks and core are in perfect balance.

The lightness, resiliency, and lack of wear of the plastic material means not only long life for the cams but

Is "PLASTIC FLOW" one of Your Finishing Problems





NOTE clean, sharp edges obtained by Wet Belt Grinding

Shows "Plastic Flow" due to Dry Method of Finishing

New PORTER-CABLE Wet Grinding Method

gives better finish on plastics at less cost!

Many manufacturers have not successfully placed their finish operations on "line" production basis because of plastic-flow, heating, discoloring, fracturing, chipping or warping of the materials.

Now with the new PORTER-CABLE Wet Belt Sander-Grinder—they are—for the first time—able to eliminate these finish difficulties. This machine may be the answer to your finishing problems. It cuts faster and cleaner, washes abrasive free from "fill-up," keeps belt usable longer. Built to maintain full output all day, every day. Types available for either flat or irregular surfaces.

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Each machine comes with two different sized screens, 1/8" and 1/4", interchangeable in two minutes . . . and with underneath chute to carry granulated plastic to basket.

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You can only be sure of trueness in plastic colors when you are sure that curing temperatures are correct. The Cambridge Mold Pyrometer offers you a simple, quick and dependable means of checking temperatures of every cavity in the mold.

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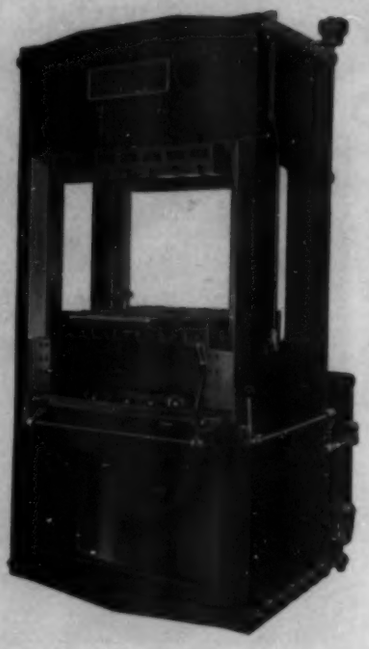

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continued, accurate, high speed operation of connected parts as well. Then, too, the cost of operating is reduced materially. It has been demonstrated that the new high speed stitchers, with their molded-laminated parts, take just half the horsepower required for the older machines.

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PRESENTATION DINNER

(*Continued from page 42*) materials for new things" and stressed the importance of machines and science getting together to produce beautiful, artistic and useful things.

"The defeatist attitude has never been the characteristic of a progressing civilization, and it certainly cannot be the sign of a growing industry," asserted Dr. Thomas. "The only limitless thing I know of is human want. Civilization itself is nothing more than the creation of wants, followed by methods of satisfying those wants.

"I like the engineering approach to the answer of this riddle. If we would have a life of plenty, we must create ever and ever more stuff. It is possible to get excited about distribution and forget that the essential thing in distribution is the creation of ever more and more wealth. This is the engineering approach—more cars, more houses, more clothes, more food, more furniture, more comforts, more everything. The engineer does not think of manipulating a little; he dreams only of creating more, knowing that in abundance there is at least possibility of adequate distribution."

Immediately following Dr. Thomas' address the plaques of award were spot-lighted on the stage and presentation was made.

Among those at the winners' tables were: W. A. Anderson, Lustron Lights, Inc.; H. E. Anthes, Bausch & Lomb; W. D. Baker, J. Havlik, Valdor, Inc.; S. Balin, S. Orenstein, Amelia Earhart Luggage Div., Orenstein Trunk Corp.; H. Berlin, Chicago Musical Instrument Co.; J. J. Bourgoine, Shaw-Walker Co.; C. K. Castaing; R. B. Cornette, R. M. Hay, R. M. Hay Co.; R. Descombes, Multicolor Watch Co.; T. Doyle, L. H. Philo Corp.; H. Dunkly, Stewart-Warner Corp.; J. P. Fewster, R. Dusko, Magic Hanger Co.; F. Eberhard, Star Equipment Corp.; C. Ellifritz, C. F. Murfin, Clif H. Murfin Co.; M. G. Falk, Republic Brass Co.; Dr. W. Feinbloom, A. Gollinger, Optical Research, Inc.; E. L. Penn, Millers Falls Co.; G. W. Gale, A. W. Cash Co.; H. C. Guhl, Westinghouse Elec. & Mfg. Co.; A. L. Hedrick, Pearson Heel Mfg. Co.; F. A. Holtz, The Pedler Co.; J. Homan, O. Haas, United Shoe

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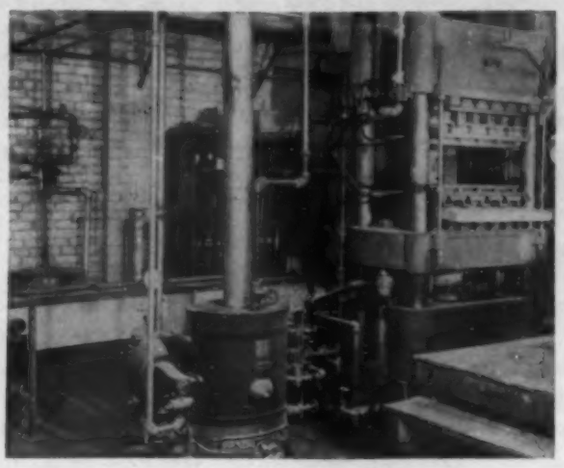

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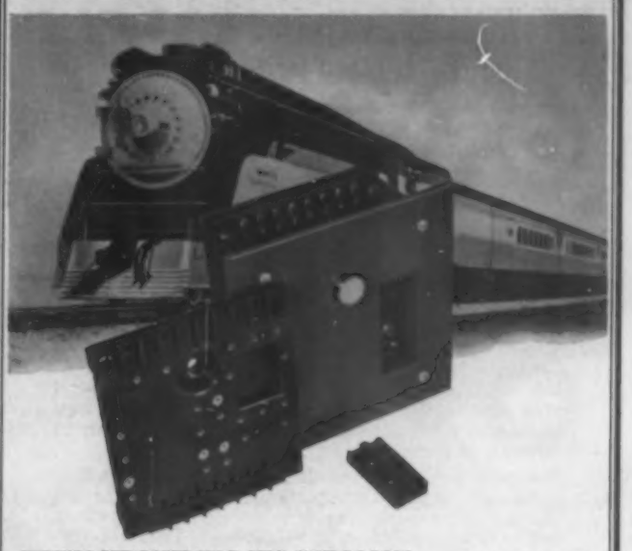

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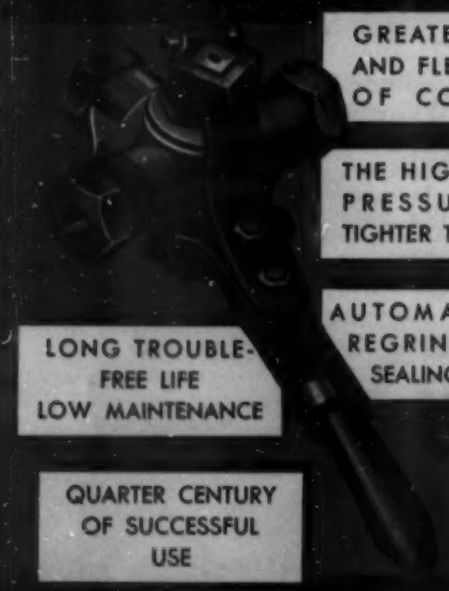

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SYNTHETIC RESINS AS WATER SOFTENERS

(*Continued from page 51*) the bed is washed with the brine solution when the calcium and magnesium ions adsorbed by the resin are replaced with the sodium ions and the property of water softening continues indefinitely. The original resin can readily be regenerated by washing with hydrochloric acid.

The organic zeolites can also be used for the removal of ammonia from the water in which case the quebracho-formaldehyde resin should be regenerated with acid. A water containing 2.7 parts ammonia per million parts of water after treatment had only 0.12 part per million.

The advantage of the organic zeolites over inorganic zeolites lies in the fact that the resins are highly durable, have great mechanical strength, do not easily crumble into powder and unlike siliceous zeolites are unaffected by waters containing free carbon dioxide. They are more easily regenerated than the inorganic materials, while the softening capacity equals that of the latter.

Resins which absorb anions are also known. For example when in the production of the above described resins, the polyhydric phenol is replaced with a polyamine like m-phenylenediamine, resins with the property of removing acidic radicals from aqueous solutions are obtained. These resins can also preferentially exchange one anion for another.

If the hard water is successively percolated first through the bed of the polyhydric phenolic resin and then through the polyamine resin, an effluent is produced which is free from all ions as all the cations are adsorbed by the former resin while all the anions are taken up by the latter. The exhausted resins are regenerated with hydrochloric acid and caustic soda solutions, respec-

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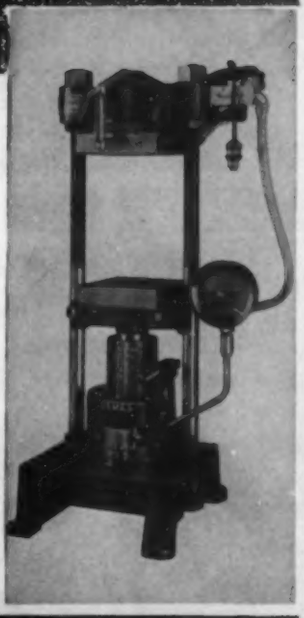

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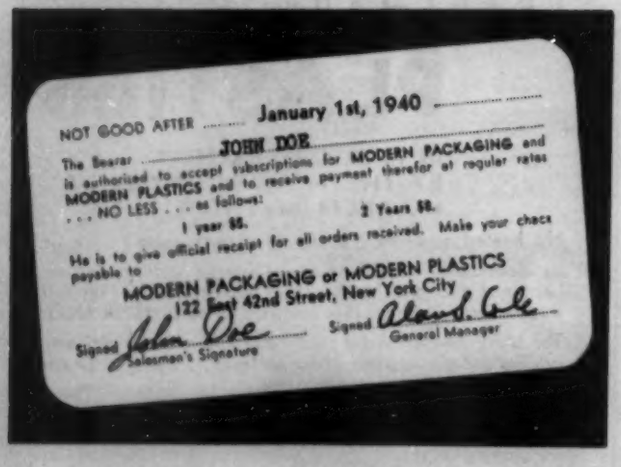
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tively. Water containing 130 parts solids per 100,000 parts of water, on treatment with these two resins yields a final effluent containing only 0.7 part per 100,000.

Since the first announcement by Adams and Holmes in 1935 of their remarkable discovery, intensive work has been performed, especially in Germany, on the development of synthetic resins as ion exchange materials. Modifications have been made in the formulations of these resins but the basic principle, however, remains the same as described by the original investigators. Phenolaldehyde resins are the basic resins for cation exchange while amine-aldehyde condensation products are used for anion exchange. Seven kinds of resins, five of which are cation exchangers and two anion exchangers, have recently been marketed by one firm alone in Germany. These resins can be advantageously employed in the following fields: water softening, neutral exchange, partial salt removal from carbonate-rich waters, neutral exchange with partial hydrogen ion exchange, complete salt removal, alternate hydroxyl and hydrogen ion exchange, and application for metallurgical and chemical purposes.

Comparative trials carried out against silica zeolites have shown the high efficiency of synthetic resins having a capacity of nearly three times that of the greensand base exchanger. The superiority of the organic material over the inorganic one lies in the ease and the completeness with which it can be regenerated.

Synthetic resins are also available which react with the salts responsible for the hardness of the water, converting them from ionized substances into complex water-soluble compounds. Even after the addition of soap, the water still remains perfectly clear. Precipitated lime soaps and carbonates are redissolved by the addition of such resins.

For softening hot water, a special resin is now on the market which has a slightly lower efficiency than that of the ordinary resin. This resin can handle water at temperatures approaching the boiling point. Synthetic resins have also been developed for the recovery of organic materials from solutions in processes for which at present solvent extraction methods are employed. Further developments in this field are expected.

INJECTION CYLINDER UNIT

(*Continued from page 49*) very short thus minimizing the stretch of these screws when they are subjected to pressure. This type of construction insures a perfect seal at joints C_4 and D_2. It also simplifies the disassembling and assembling of C and D. Section D_1 is made a separate part of D so that a perfect machine job is assured on machining the elbow. D_1 is then made to coincide exactly at seat D_3. This seat is made permanent by welding D_1 to D at their threaded joint.

From the preceeding paragraphs it will be noted that simplicity has been applied throughout the entire phases of design of this injection cylinder unit. The adaptation of this policy to machine design has always proven successful.